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Volume 2 Number 1
June 1983 $2.95
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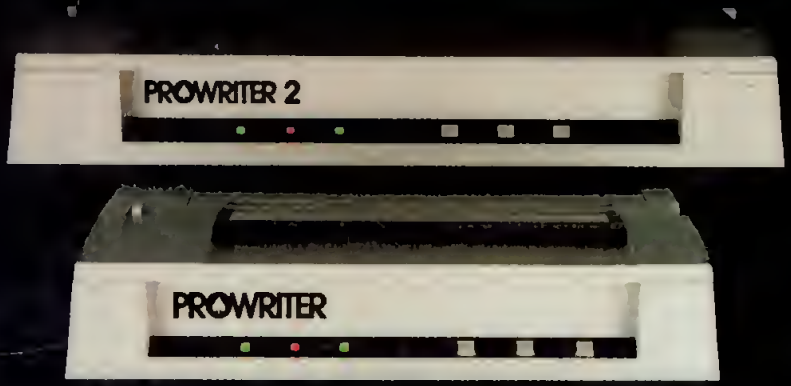
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| | | |
|---|---|---|
| 1 | FIRST NAME | ROGER |
| 2 | LAST NAME | SMITH |
| 3 | BALANCE | 3261 |
| 4 | PAST DUE | 30 |
| 5 | CALCULATED INTEREST | |
| 6 | AT 1.5%/MO | |
| 7 | IS | 48 92 |

Go to **VisiCalc** and Calculate Interest Charges

RECORD NUMBER 7

| | | |
|---|---|---|
| 1 | FIRST NAME | ROGER |
| 2 | LAST NAME | SMITH |
| 3 | BALANCE | 3261 |
| 4 | PAST DUE | 30 |

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Your timeliness will be much apprec

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- ☐ VisiCalc
- ☐ Microplan
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**CIRCLE 116 ON READER SERVICE CARD**



The Independent Guide to IBM Personal Computers

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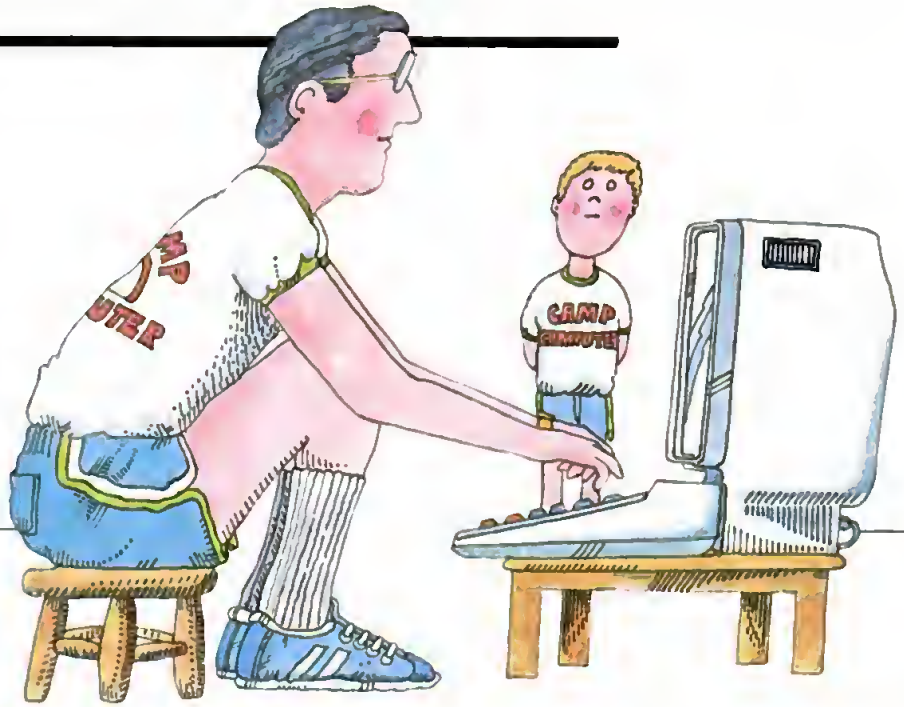
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Volume 2 Number 1




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*This is Volume 2 Number 1—the June issue—of PC Magazine. It follows Volume 1 Number 12, the April issue. There was no issue of PC designated as "May." PC has not skipped an issue, however. The month designation has been changed simply to correct an inherited late production schedule.*

*You will now receive PC at the beginning of the month of issue rather than late in the month. This change does not otherwise affect your subscription. For example, you have a 1-year subscription to PC, you will receive 12 issues, one each month.*

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COVER

Illustration by Marc Ericksen.

# It took hundreds of years to build the world's most advanced spreadsheet.

Way back in 1534, a Venetian scholar wrote a text that standardized the techniques of modern bookkeeping. And up till 1979, there weren't a lot of real improvements in the way people did spreadsheets. You still had to enter all your figures by hand. Run all the totals yourself. And when you had to make a few changes, you had to run the totals all over again.

Then along came a program that let you create spreadsheets on a personal computer. Without touching a pencil. Or adding anything by hand. Best of all, this new program gave you the freedom to look at your balance sheet a dozen different ways if you felt like it. Because all you had to do was change one figure, and the computer would refigure everything else for you. Automatically.

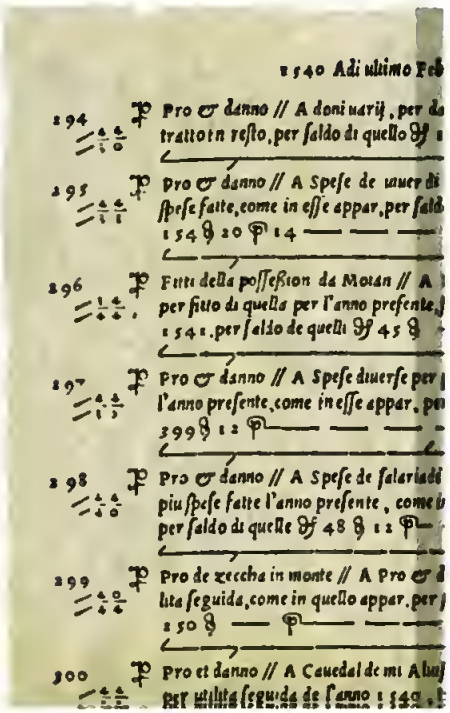
Like most breakthrough ideas though, this original spreadsheet program had a few things that definitely needed improvement. For instance, all the columns had to be the same width. And the entire system took about 20 hours to learn.

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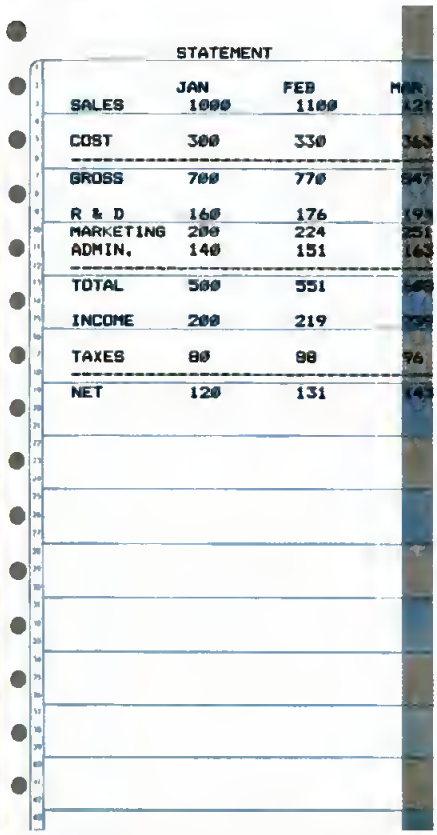
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300 Pro et danno // A Cauedal de mi A
per utilita seguida de l'anno 1541

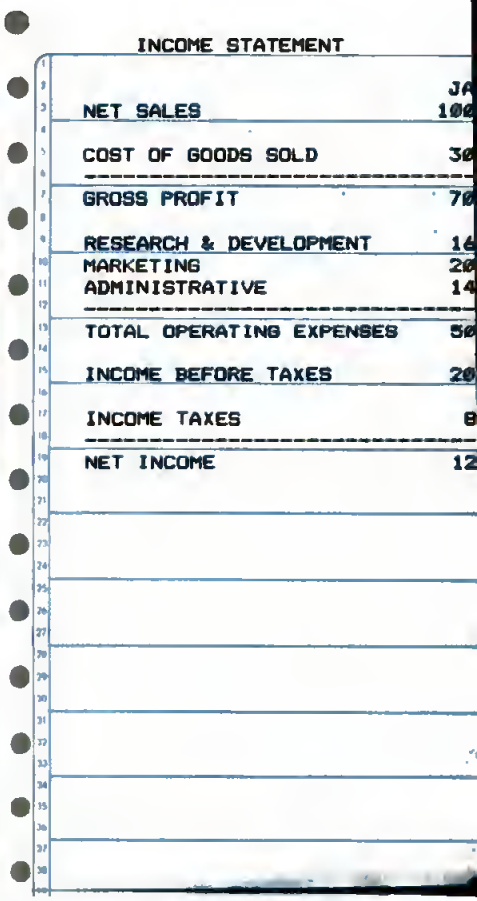
## 1979



STATEMENT

| | JAN | FEB | MAR |
|---|---|---|---|
| SALES | 1000 | 1100 | 121 |
| COST | 300 | 330 | 363 |
| GROSS | 700 | 770 | 847 |
| R & D | 160 | 176 | 193 |
| MARKETING | 200 | 224 | 251 |
| ADMIN. | 140 | 151 | 163 |
| TOTAL | 500 | 551 | 606 |
| INCOME | 200 | 219 | 241 |
| TAXES | 80 | 88 | 96 |
| NET | 120 | 131 | 145 |

## 1981



INCOME STATEMENT

| | JA |
|---|---|
| NET SALES | 100 |
| COST OF GOODS SOLD | 30 |
| GROSS PROFIT | 70 |
| RESEARCH & DEVELOPMENT | 16 |
| MARKETING | 20 |
| ADMINISTRATIVE | 14 |
| TOTAL OPERATING EXPENSES | 50 |
| INCOME BEFORE TAXES | 20 |
| INCOME TAXES | 8 |
| NET INCOME | 12 |

# It'll take you 10 minutes to learn it.




With SuperCalc², you get all kinds of features that have never been possible before. Like custom formatting capabilities. Automatic consolidation. Sorting. And more. Take a look at the spreadsheet below, and you'll see just how much we're giving you.

Best of all, we made it just as easy to use as the original SuperCalc. There's a self-paced starter guide that shows you exactly what to do, step by step. And an AnswerKey™ that gives you instant help right on the screen. Because of these features, you can actually create your first spreadsheet in 10 minutes flat. Even if you've never used a computer before.

SuperCalc² is available for the IBM PC and XT. Where it can run in full color. With full memory. Even on hard disk. It's also available for CP/M, CP/M-86, MS DOS and other operating systems, so you can use it with most popular personal computers.

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Percentages.

User-set decimal places.

```
COMPANY CONSOLIDATED MONTHLY PAYROLL

Today's Date                    4/15/83        Deduction Percentages
Payroll Start Date              4/ 1/83        Fica              6.700%
Days this period                   15          SDI               .8%
Recalculate YTD Y/N ?  N

                                  Gross          Total          Net          YTD
 Emp#  Employee name    Status    Salary         Deduct         Pay          Gross
 ==========================================================================
  34   Adams             M     $1,100.00  ( $82.50)  $1,017.50    $6,200.00
  49   Beckette          S       $750.00  ( $56.25)    $693.75    $5,250.00
  84   Johnson           S       $850.00  ( $63.75)    $786.25    $5,950.00
  92   Jones             M       $900.00  ( $67.50)    $832.50    $6,300.00
  12   Samson            S       $560.00  ( $42.00)    $518.00    $3,920.00
  19   Santos            M       $650.00  ( $48.75)    $601.25    $4,550.00
  45   Smith             S       $700.00  ( $52.50)    $647.50    $4,900.00
 ==========================================================================
 Total # employees          7

 Total Gross Salaries (100's)      $55.1
 Total Deductions (100's)          $-4.1
 Total Net Pay (100's)             $51.0
```

Floating $ signs.

Embedded commas.

Negative numbers in ( ).

Arrange reports numerically or alphabetically, like this

Numbers in 100s or 1000s.

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**SORCIM**

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San Jose, CA 95131
(408) 942-1727

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  TEL 08802-691
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Both programs create a dialog between you and your PC. Set your own pace while you learn easily, quickly . . . and inexpensively.

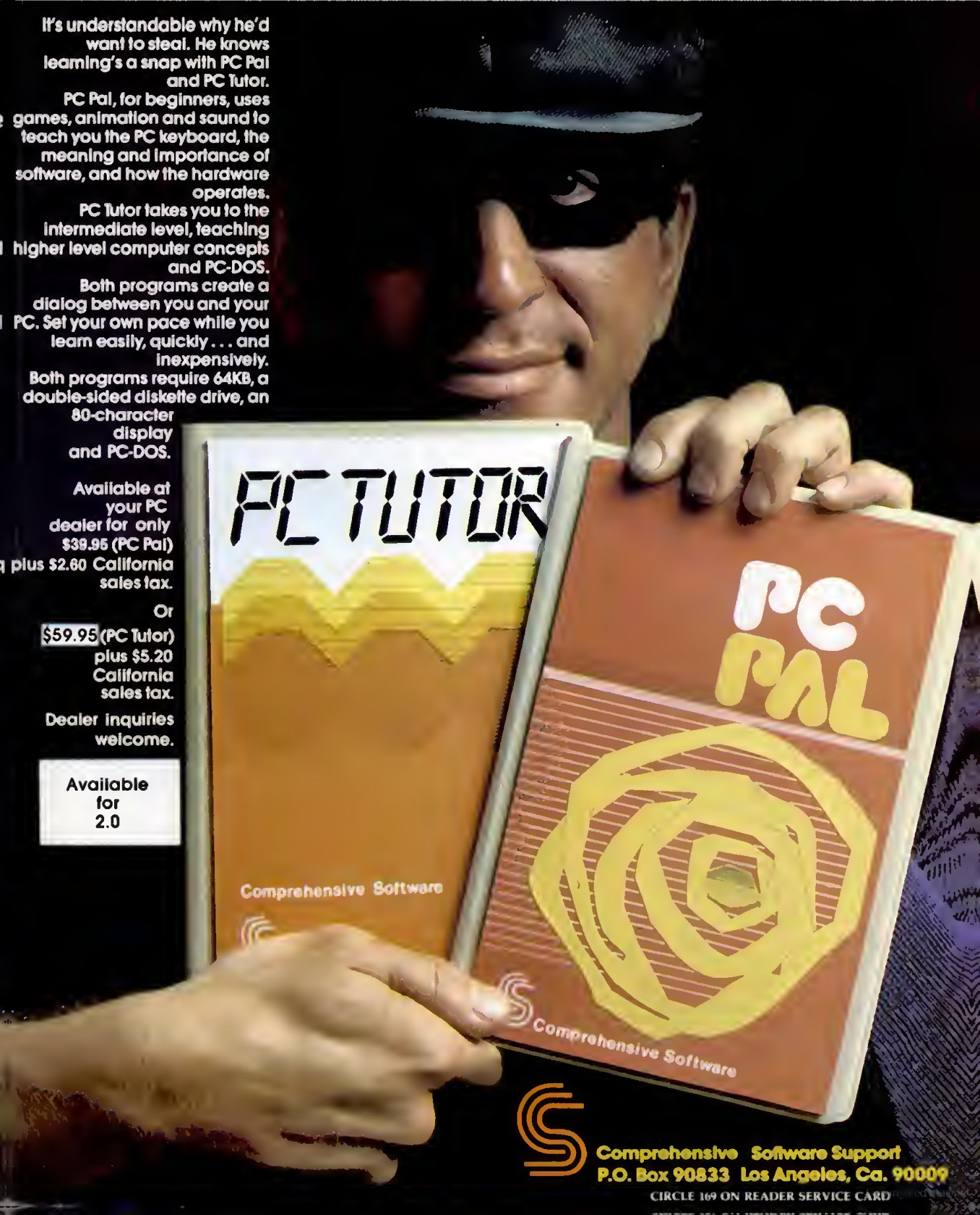
Both programs require 64KB, a double-sided diskette drive, an 80-character display and PC-DOS.

Available at your PC dealer for only $39.95 (PC Pal) plus $2.60 California sales tax.

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# Finally, aliens your kids can reason with instead of destroy.

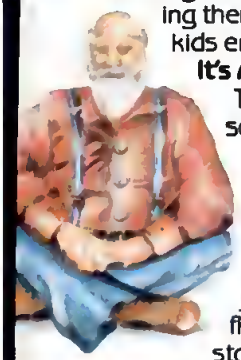




**This year, thousands of kids will be searching for the most amazing thing.**

At Spinnaker, we don't believe in the "kill or be killed" concept behind most computer games. In fact, we believe computer games should be instructive. Not destructive. But just as importantly, they should be fun.

That's why IN SEARCH OF THE MOST AMAZING THING™ is designed to let your kids negotiate with aliens instead of destroying them. Because given the opportunity, kids enjoy using their minds.



**It's Amazingly Fun.**

The Most Amazing Thing is out there somewhere. Finding it won't be easy. But relax, your kids will have the help of their old uncle Smoke Bailey. He'll give them a B-liner (sort of a cross between a hot air balloon and a dune buggy) to use on their journey. They'll have to learn how to fly the B-liner and navigate it through storms and fog. But before they do anything, your kids will have to talk to Old Smoke. He'll tell them about the Mire People and the strange language that they speak. He'll also tell them to avoid the dangerous Mire Crabs and how to get fuel for the B-liner.

Your kids will visit the Metallican Auction where they'll trade with the aliens for valuable chips. Your kids will then use these chips to buy things they'll need for their trip. And your kids will learn how to fly over the planet using their jet pack.

The Most Amazing Thing holds great powers, but it will take great skill, persistence and imagination to find it.

**It's Amazingly Educational.**

IN SEARCH OF THE MOST AMAZING THING is written by Tom Snyder, educator and author of the best-selling Snooper Troops™ Detective Series.

And like all Spinnaker games, IN SEARCH OF THE MOST AMAZING THING has real educational value. For instance, your kids will sharpen their ability to estimate distances and quantities. And since they'll be navigating their B-liner, they'll become aware of distance, direction and time. They'll also develop a knack for economic and monetary principles through trading with the aliens. And they'll solve problems through trial and error.

They'll learn all of these things, plus they'll learn that nothing is impossible if you put your mind to it.

**A Novel Approach to Computer Games.**

Besides offering your children all of the above, IN SEARCH OF THE MOST AMAZING THING gives them an opportunity to develop their reading skills. Because included with the game is Jim Morrow's new novel The Adventures of Smoke Bailey.* So your children will have hours of fun reading the book or playing the game. And they'll be learning at the same time.

**Parental Discretion Advised.**

If you're a parent who would rather see your kids reason with aliens than destroy them, you've got plenty of reasons to ask your local software retailer for IN SEARCH OF THE MOST AMAZING THING. It's compatible with Apple,® IBM,® Atari,® and Commodore 64™ computers. And it offers so much fun you'll probably be tempted to play it yourself. Or you can write us directly at: Spinnaker Software, 215 First Street, Cambridge, MA 02142.



You'll find this is one computer game that won't alienate you from your children.






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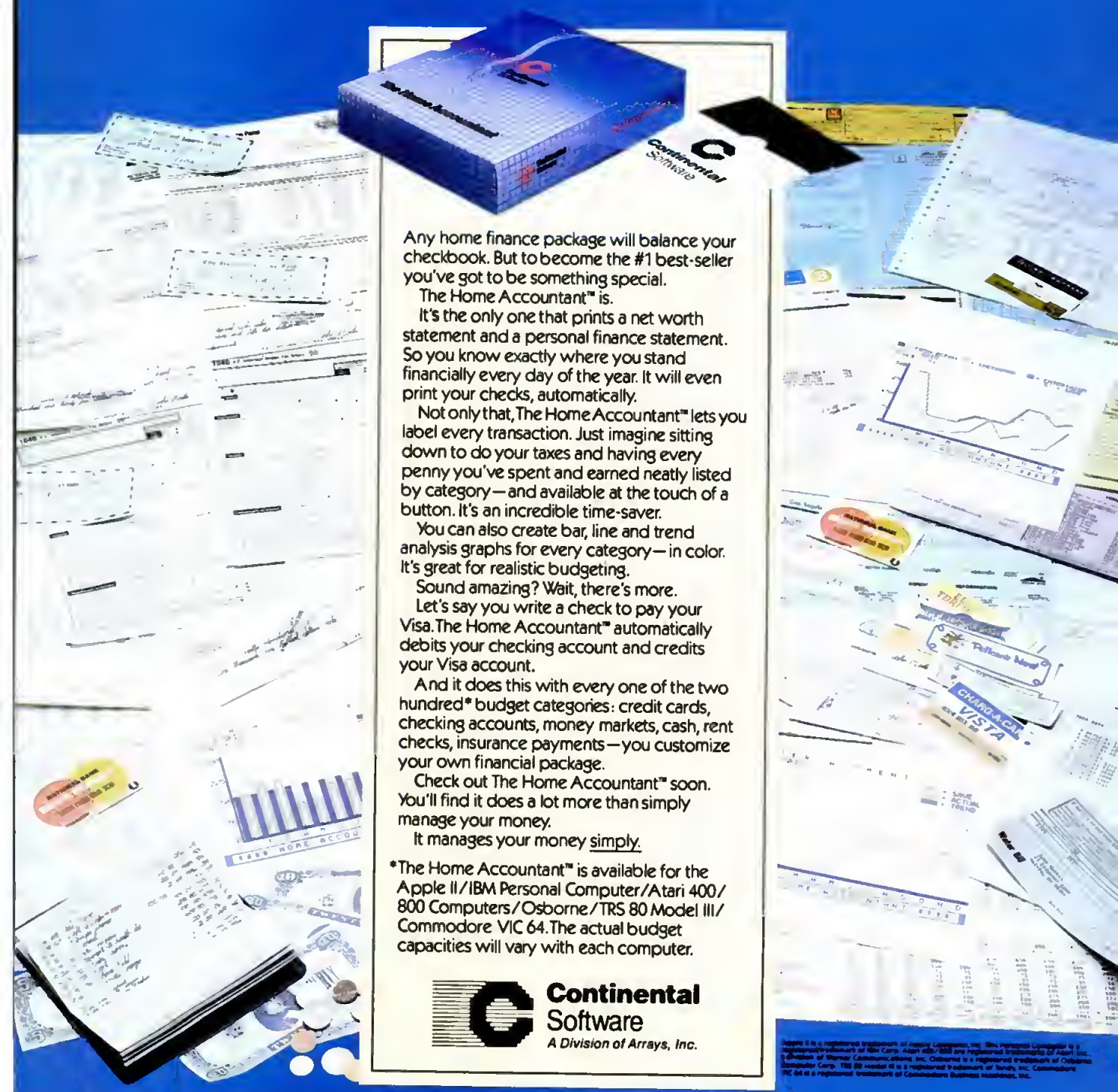

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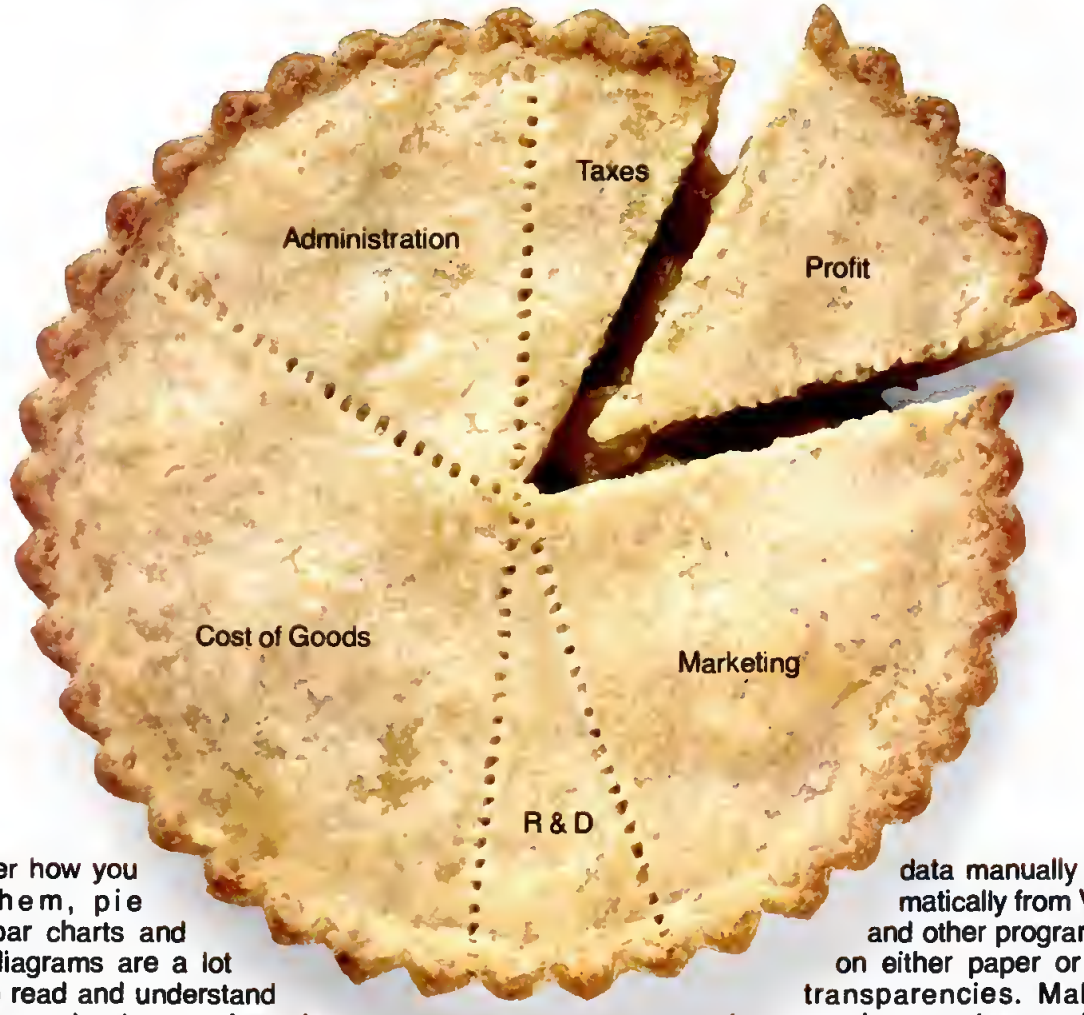
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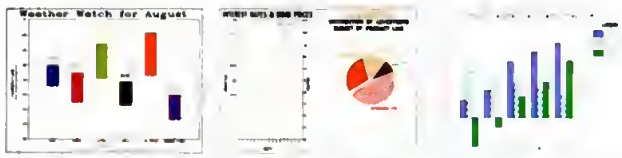
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- BACK-UP 5 MEGABYTES IN TWO MINUTES
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A revolutionary new 10 Megabyte Hard Disk Drive that includes a 5 Megabyte removable hard disk cartridge. The cartridge drive system simply plugs into your computer, and includes all necessary software and hardware. Genie Drives are compatible with most popular software, and each cartridge replaces over 30 double-density floppy disks.

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Up until now, people with serious mass storage applications have had no realistic means of conveniently maintaining their large data bases due to the cost of storage media and the expense and inefficiencies of doing back-ups. The Genie systems approach solves such typical storage problems by allowing both high capacity Fixed Drives and 5 Megabyte Removable Cartridge Drives to be intermixed on the same computer system. This provides the ultimate storage solution because of the new ease of doing back-ups, along with ability to maintain several large data bases on removable cartridges, eliminating the need to tie up expensive disk drives over a single data base application. **With Genie Drives, the combinations are unlimited.** Flexibility and versatility were key design considerations. A user can configure up to eight of our Drive Products in any combination to derive a storage solution for just about any application imaginable. With Genie, your personal computer can now take on tasks that had only been possible with mainframes.




MODEL X5A

X5™

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## 5-10-15-20

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10 MEGABYTES
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20 MEGABYTES

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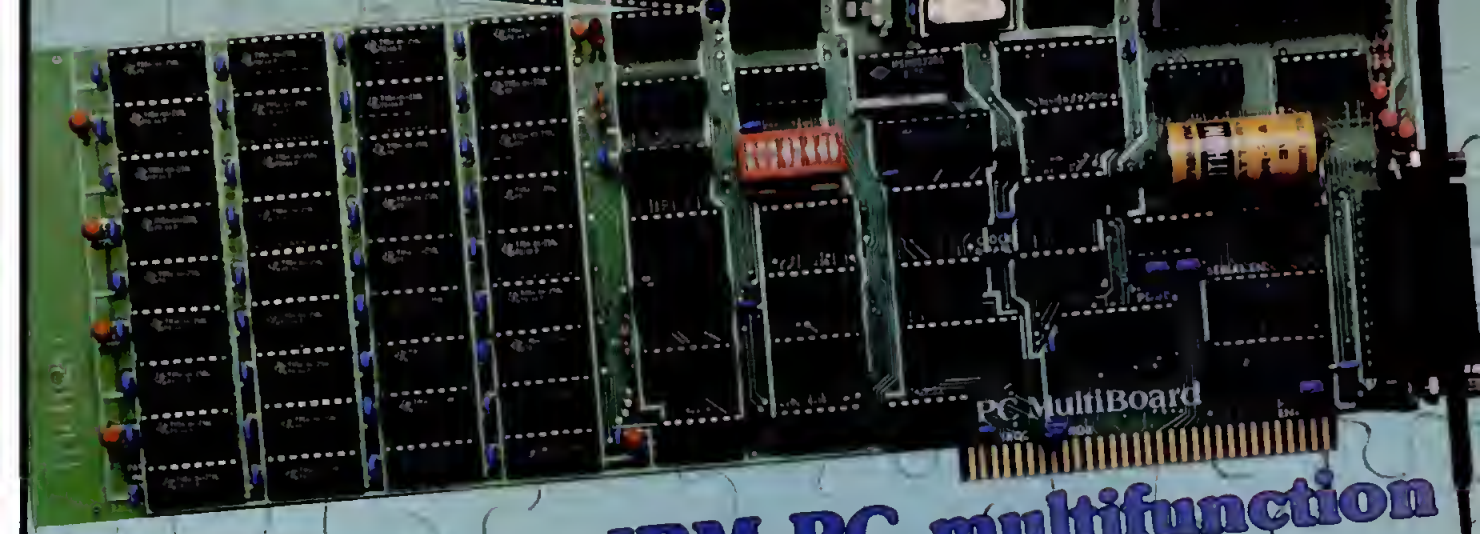
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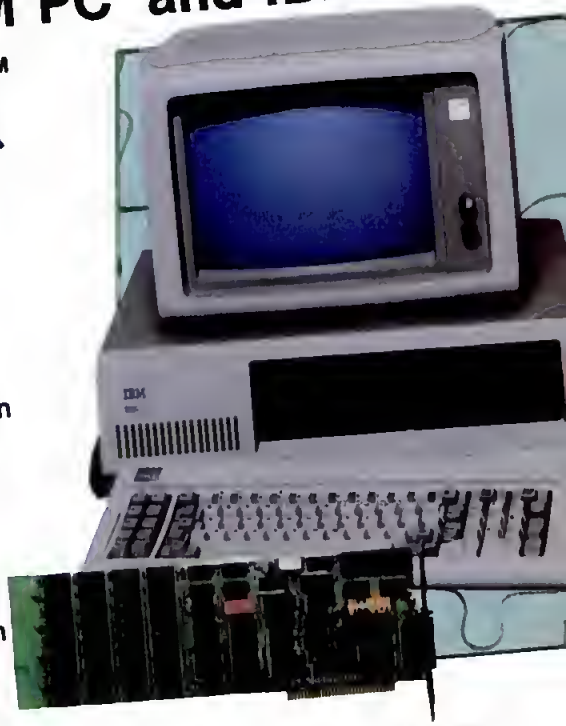



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# ANNOUNCING THE END OF WORD PROCESSOR CONFUSION




It's one confusing business, choosing a word processor. All those companies assuring you theirs is the most fantastic one of all. And leaving you to cut through all the smoke and hopefully whittle them down to the best one for you.

Well, we can help. If you'll just invest the next three minutes reading this, we'll tell you about a word processor that makes picking the right one a real breeze.

**FIRST, A WARNING.** There are two things you must do when evaluating any word processor. First, be careful. It's no secret that many of today's claims about being easy to learn and use just don't stand up to careful comparison. Watch carefully for complicated codes and programs that require "training sessions." Secondly, be selective. Buy a word processor you can use on a daily basis, not one that requires another "training session" when someone goes on vacation. In other words, be very careful to select the word processor that's absolutely the best and easiest to use. Which is what we'll now introduce you to.

**WHY ONE WORD PROCESSOR MAKES THE MOST SENSE OF THEM ALL.** Meet WordPlus-PC. It's the advanced, "user-oriented" software package that turns your IBM-PC computer into a word processor equipped with the sophisticated capabilities of far larger, more expensive systems.

**THE REMARKABLE WORDPLUS-PC STORY.** In a nutshell, it's this. WordPlus-PC was designed from the ground up to be the very latest in word processing technology. It has all the important features you could ask for. And the program is so easy to learn and use it defies comparison with other software.

**HOW WE CAN BE SO SURE OF OURSELVES.** We're Professional Software, a leader in word processing software with over 30,000 customers contentedly churning out letters and documents around the world on personal and business computer systems. We know precisely what a top quality word processor must do. And we've studied all the shortcomings of our competitors. That's how WordPlus-PC came to be the easiest-to-use word processor ever.

## ALL THE FEATURES YOU'D EXPECT.



WordPlus-PC is both powerful and versatile. Its long list of major functions includes movement of paragraphs, global search-and-replace, and creation of multiple "boilerplate" and personal letters with the touch of a few buttons. There are 3-line headers and footers and automatic page numbering. When you underline or boldface words as you type, WordPlus-PC displays them in that form on the screen. You can merge information created by popular spread sheet programs. You'll create personal letters quickly and easily, or merge name and address information from other programs. You can easily create standard layouts for preprinted forms and use WordPlus-PC to prepare invoices or quotations. For large corporate customers, WordPlus-PC has the capability to merge information from files created by the firm's mini or mainframe computer. You can even type new documents while the system is printing other ones. And you'll find WordPlus fully compatible with virtually all popular ASCII letter-quality and dot matrix printers.

## A BREEZE TO LEARN AND USE.

With WordPlus-PC's easy-to-use documentation, you'll be using your word processor right from the first minute. After an hour, you'll feel at home with all the basic functions and ready to explore the more sophisticated ones. After a few hours you'll put the manual away. There are never any complicated or confusing codes to memorize or look up. Rather, the screen's "message area" reminds you how to do what you want. WordPlus-PC's unique keyboard color coding makes things even easier. And whenever there's a question, simply press the HELP function to get back on track.

**ALL THE HELP YOU NEED VIA TOLL-FREE PHONE.** Learning something new goes best when you have encouragement, reassurance and answers to questions. That's how WordPlus-PC helps you learn. In addition to the help you'll get from your dealer, we're ready to assist you when you call our special toll-free number and talk to one of our carefully trained advisors. This service is available at no charge during the 90 days following receipt of your user registration card. It's all part of Professional Software's total commitment to customer service and support.

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# Innovators in Winchester Subsystems!




## TALLGRASS AND YOUR IBM® PC

Tallgrass Technologies is the industry leader in Winchester HardFile™ and streaming tape subsystems for the IBM® PC and related computers. Fortune 500 corporations, banks, governmental agencies, and small businesses throughout the world depend on Tallgrass HardFile subsystems for their mass storage and backup requirements.

Tallgrass offers formatted capacities from 6.25 Mb to 70 Mb with integral streaming tape back-up. Our proprietary disk/tape controller with integral 10K track buffer optimizes read/write activity and, coupled with our DMA host interface, offers high performance previously unavailable with 5¼" disk systems.

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FROM THE EDITOR'S SCREEN/COREY SANDLER

*In the early days of radio, lonely announcers wondered who their listeners were, and what they thought of the show. The medium is different, but nothing has changed.*

# Getting To Know You



***IT'S NICE TO HAVE some idea of who is out there.***

Illustration Don Day

Welcome to Page 31 of *PC Magazine*. You've no doubt worked up a good head of steam already, having made your way through about 4.9 percent of this monthly Brobdingnagian tome. If our calculations are correct, this means that you are roughly 7.7 minutes into an expedition of 3.9 hours. We really appreciate the time you have taken for this purpose, aspecially since that time is worth about $113.99, before taxes, based on your family's median incoma.

Of course we know that *PC Magazine* is very important to you—both at work and at home. In fact, for about 67 percent of you, home is where you hang your microcomputer. However, work presents no escape from the digital demands of homa and hearth, for 47 percent of you have an IBM PC at tha offica. (A little more than 10 percent reported othar brands as a primary or secondary machina.)

I'm 94 percent sure that 87.3 out of a hundred of you have guessed by now that wa've begun digesting the results of a survey of some of our subscribers. These polls are conducted primarily for the benefit of our ad sales staff, so that they can convince advertisers of the worthinass of an investment in space in PC. As you may hava noticed, they've had soma success in this area, as well they should. But tha numbers, and the portrait that can be drawn from them, are also closely examined here on the editorial side. It's nice to have some idea of who is out there at the and of the long and laborious process of planning, writing, aditing, and designing this magazine.

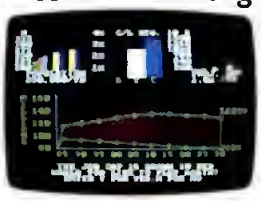
We now know, for axampla, that you're a pretty well-educated guy. The survey-takers inform us that 96 percent of you have been to college, with 82 out of 100 of you owning a sheepskin. Another 40 percent of subscribers to PC hava aarned graduata dagrees, and one out of seven of the survey respondants say thay hava earned the right to be called "Doctor."

# COLORPLUS™
# Shatters The Mold.



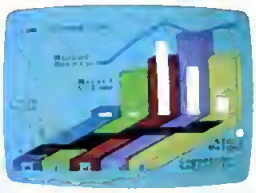
A vibrant, varied new world of color is now at your fingertips.

We've shattered the mold for color graphics adapters with COLORPLUS, a high resolution, full color breakthrough fully compatible with IBM Personal Computer hardware and software.



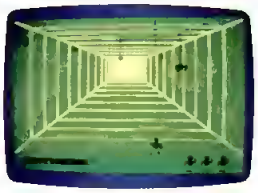
COLORPLUS produces incredibly sharp, detailed multicolor graphics of professional quality at a low PC price. Its state of the art biplanar technology enables high resolution 4 color 80 character graphics or medium resolution 16 color 40 character graphics.

The current IBM PC capabilities of high resolution 1 color 80 character graphics and medium resolution 4 color 40 character graphics simply pale in comparison, now that the era of COLORPLUS has arrived.



Using only a single expansion slot, COLORPLUS includes an integrated parallel port, thereby saving you an expansion slot for future needs. No modification is required to existing software in the IBM modes. Enhanced software supporting COLORPLUS Graphics capabilities is currently available from major software suppliers.

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The goal of PC+ products is to expand your options, to make your personal computer more valuable and productive. COLORPLUS is just one example of our commitment to that objective.

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## Ladies' Home Computer?

Oh, by tha way, no offense was meent to our femala readers by the use of tha word "guy." It's just that our survey-takars didn't run across very many woman. Tha supposedly representative sampla of subscribers indicated a readership that's 97 percent male. We have no intention of ignoring tha spacial naeds or interests of woman though, and we further suspect that thare are more women out thare than tha survay suggests. (Could it be that women are more likaly than men to ignore questionnaires? Do men open tha mail first? Do woman prefer to buy their copies of PC at the newsstand or at a computer store?)

Whatavar the case, more and more women are getting into the field of microcomputers, and we beliava they'll find PC Mogozine to their liking. But whila wa're on the subject, men, why not make it e point to introduca PC to your mala ond femala co-workars, friends, end relatives.



***THE MOST common configuration of PC equipment among those surveyed is a machine with 128K RAM and at least three plug-in boards.***

We hope they will aventually buy their own subscriptions, but in the meantime thay will sarve to expand what wa know to be the 1.9:1 ratio of readers to each copy of the magazine.

Spaaking of basic equipment, we were informed thet tha most common configuration of PC equipment among those surveyed is a mechina with 128K RAM and at least three plug-in boards, which should bring comfort and hope to the manufacturers of add-ons. Dot metrix printers ovarwhelmad letter quality printers in home uses (72 percent versus 9 percent); at the office the dot matrix was present in 80 percent of the situations, a lettar quality printer in 28 parcant. More than a quarter of all subscribers responding said they used a color monitor with their PCs.

BASIC is definitely tha languaga of choice, winning 88 parcent of homa market and 77 percent of busIness epplications. And tha battla of the oparating systems? PC-DOS wins hands-down In this survey: 93 percent in tha home and 91 percent In the offica. Tha UCSD p-systam and CP/M-86 were in tha low singla digits in both situetions.

Now, slava though we do ovar every word end articla of punctuation in PC, we are also aware of how important the advartisements are to our readers. We ware told that eight out of ten subscribers read most every ad in PC. And 44 percent reported buying a product they learned about from an advertisement. But it doesn't stop with your personal purchases: 85 percent said they had recently advised a friend on the purchase of microcomputer equipment and nearly two-thirds had offered advice to business associates or their employers. I trust you are keeping track of your commission checks.

Oh well, it is time to release you from this page and let you continue your travel through these pages. Plaasa be sure to say hello for us to your 1.249 children undar the age of 19, your .837 of e car, your 1.67 talevision sets, your. . . .

* * *

In this issue, we venture for the first time beyond the Blue horizon and into tha realm of the PC "clones." Wa do so with great care, for it is our intention to focus on the personal computer products of IBM and thosa competitive machines that are truly intarchangeabla. We look with autometic skepticism upon advartised cleims of "PC Compatibility"—cleims thet have mada their way unquastionad into tha columns of other magazines.

A first point: No machina can be a true clone, for this would by definition infringe upon IBM's patants and copyrights. So the search is actuelly for the most perfect first cousin.

***WE LOOK with automatic skepticism upon advertised claims of "PC Compatibility."***

From this seat, I can see three princlpal categories of compatibility. First are "PC Look-Alikas." Thase are low, wide boxes with black disk drives, a row of coolIng slots on the laft sida, e detached keyboard and monitor, and probably a cream, gray, and black color scheme like tha PC's. But don't try and run a PC-DOS program or read a PC-DOS data disk. Inside the box may wall ba a Z-80 or a 68000 or a 8502 or some other alien microprocessor.

Next category would be "PC Run-Alikes." This type of machina may or may not look like an IBM PC, but inside is an 8088 (or an adapted 8088) microprocassor, which opans tha door to kinship. However, Run-Alikas do not automatically eccept any and all software or date producad for or by an IBM PC. Programs may need extensive adaptation. Or, they may be able to read a PC-DOS data disk, but not perform any oparations upon it. There is also a class of run-alikes that use different-size disk drives.

And finally, tha "PC Work-Alikes." To achieve this first cousin status, a computer must accommodate the user who takes a disk from an IBM PC, walks across the room, and plugs it into tha "foreign" mechine. We shell award the title "clone" only to thosa micros that maet this rigorous standard.

Caveot obacorum emptor.*

—Corey Sondler.

(*Computer buyer beware!)




# THE GOLD STANDARD

## You can wait for industry standards to mandate improved performance. Or you can have it now on Maxell. The Gold Standard.

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An advanced binder bonds oxides to the base material preventing time and money-wasting dropouts. Calendering then smooths the surface for a read/write signal that stays clear and accurate. And lubricants reduce friction between head and disk for a longer media and head life. To house it, we then constructed a new jacket heat-resistant to 140° F to withstand drive heat without warp or wear. And created the floppy disk that leads the industry in error-free performance and durability.




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# IBM® PC Owners . . .

# First we solved your printer problems

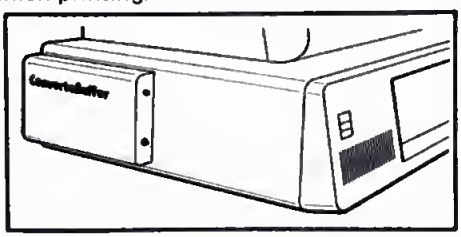
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**IT'S A CONVERTER.** There was a time when buying a letter quality printer meant giving up graphics. Now, however, ConvertaBuffer™ gives you the best of both worlds by allowing you to print the business graphs generated by programs such as MBA and 1-2-3 on letter quality printers such as Diablo and NEC. And, the quality of these graphs are as good as those drawn by dot matrix printers such as the IBM/Epson. ConvertaBuffer translates the Epson-format graphics data output from MBA, 1-2-3, and other packages with graphics capability into the format necessary for printing on a letter quality printer.

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**EASY TO INSTALL.** ConvertaBuffer comes with its own built-in cables which plug directly into your PC's printer adaptor and your printer's cable without removing the cover of the system unit — there is no need to buy an extra cable. And, each unit has its own fully regulated DC power supply — the unit does not steal power from the PC or the printer.



ConvertaBuffer also features a convenient front panel switch which resets the buffer to abort the printer output if desired. And, the status light indicates when ConvertaBuffer automatically switches to the graphics mode.

**HAVE YOUR CAKE AND EAT IT TOO!** The parallel-to-parallel ConvertaBuffer for graphics is the latest member of the ConvertaBuffer family. The original ConvertaBuffer enables you to connect any RS-232C serial interface equipped printer directly into the parallel printer port of your PC with up to 32K bytes of printer buffering.

Ask your dealer about ConvertaBuffer for graphics and the original ConvertaBuffer. Or contact us.

**von Leivendyke**
**ENTERPRISES**

Silvermine Avenue Norwalk, Connecticut 06850 203-646-4973

Please send me further information on ( ) graphics ( ) original ConvertaBuffer.

I have a _____ printer, with ( ) parallel ( ) serial interface.

Name _____ Phone ( ) _____

Street Address _____

City _____ State _____ ZIP _____

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1-2-3 is a trademark of Lotus Development Corp
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CIRCLE 469 ON READER SERVICE CARD

# CRUI

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# NCH!




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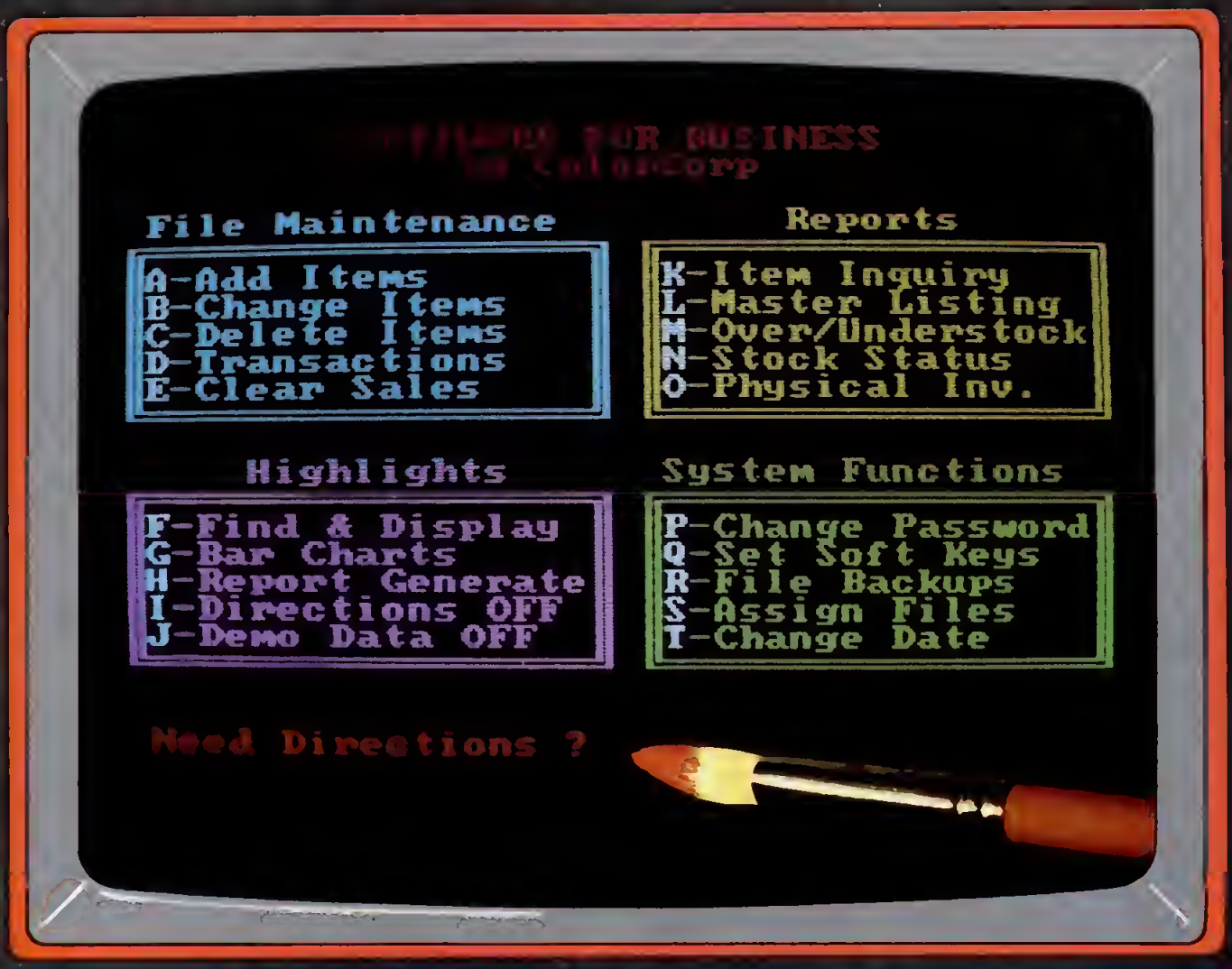
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CIRCLE 163 ON READER SERVICE CARD

# Letters To PC

## Calling All dBASE-ers

In responsa to the "Calling All Readers" plea from Peter L. Boehme (Letters to PC, Volume 1 Number 9) there does exist a dBASE Usars Group in San Francisco. The group can ba contacted at (415) 474-6693.

Boehme is also invited to contact the Teachar Education end Computer Center (TECC), wbicb intends to provida training on the IBM PC and which will be using dBASE II to organize its operations. Please note that TECC is looking for good instructors familiar with the PC and the K-12 classroom to offar courses in word processing, spreadsheet programs, and progremming in Pescal. TECC can be reached et (415) 881-6218.

This kind of human resource networking could be an ongoing service of PC. You are already doing a tarrific job in many othar areas.

Lynall Burmark
Hayward, California

*Thanks for helping us fulfill Peter Boehme's request. Wa ore olwoys hoppy to pass along information to our readers.—Ed.*

## End-Users, Unite!

Your magazine has become a respectad source of informetion for PC users end potential users. I have e suggestion to make it even better.

Includa e listing of consumar advocacy groups to help harried computer buyars find evanues for recourse when thay encounter unresponsive vendors or manufacturers. The computar industry is in e stata of flux; all too often the and-user is lost in a malee for profits and ganeral confusion over new technology. It seems likely that true support and accountebility in the industry will only be echiaved through consumer activist tactics.

You would do e great service to the industry and end-users by occasionelly printing a list of computer consumer protaction agancies (if thay axist) or suggestions about how to start such a group. If the industry knows that consumer "watchdogs" ere monitoring its performance, perhaps when we call for help we'll no longer bear thet noxious quas-




tion, "Are you a dealer or an end-user?" (with its inavitabla follow-up, "If you're an end-user, cell your dealer"—es if we haven't already tried!)

Consumars should be entitlad to an honest effort on the part of dealers and manufacturers at resolving problems with computar products.

Halen Harvey
Oakland, California

*We're plonning o consumer issue for Volume 2 Number 2, and we'll be glod to consider your suggestion.—Ed.*

## For the Record

Your readers deserve better information than what was providad by "Five Financial Programs for tha Homa" (Volume 1 Number 10). To sat tha record straight, Money Moestro:

1) provides up to 200 payees and/or categories on e 64K system. Thase files are complately configurabla by the user. Each of the categories can heve up to seven ettributes.

2) ellocates eight transactions per 1K. On a typical 160K date disk, 1,280-transactions.

3) does allow split transactions.

4) does permit "what if" and forecasting in its budgeting feeture.

5) produces filas in BASIC Sequential Formet, with exemples for uses provided in the manual.

6) has a "practice" feeture that helps the user gain mastery by running tha program on sample deta files.

7) has batch processing capabilities by maans of its Stockpiling feature.

InnoSys intends that you don't heva to be an eccountant or a programmar to use Money Moestro; maybe that's why thare are so many satisfiad users.

Joseph Mancini
InnoSys Incorporated
Barkaley, Californie

## Software for Students

I am planning to purchese e microcomputer for student use in my tutoring business. Can you provide me with information ebout educational softwere? I have purchased saveral issues of PC end have written to several software distributors, but I'm uneble to locate anything but e few meth games.

Margena Tadd
Heber City, Utah

*Toke o look ot "Educotionol Softwore for the PC," Volume 1 Number 8, and for background, "The Blossoming of Computer-Aided Instruction," Volume 1 Number 12.—Ed.*

## Wish Fulfillment

We were dalighted to find one of the features of our BASIC Development Systam (BDS) product in your "Wish List" (Voluma 1 Number 10).

Single Stap Trece pauses before executing each new line and waits for key-

# Letters To PC

board input to continue. The line number is placed in the upper-right corner of the screen so it doesn't interfere with progrem displays. You may breek out of this trace mode at any time to examine veriebles, then continue tracing. This mekes it easy to follow the progrem logic and catch those hard-to-find bugs.

BDS also provides e long list of eddi-tionel BASIC lenguege progremming tools. For more information, write to Sof-Tool Systems, 8972 East Hempden Avenue, Suite 179, Denver, CO 80231.

Ken Snapp
President, SofTool Systems
Denver, Coloredo

A contributor to the "Wish List" in Volume 1 Number 10 asked for an adapter plug to connect non-IBM monitors to the PC system unit. Dynalysis hes a new product thet does exectly that.

The monitor conversion cord allows the user to turn on a non-IBM monitor with the mein computer power switch. It edepts any non-IBM monitor or TV set to the PC system unit. The conversion cord can accept any standerd two or three prong plug.

The conversion cord is available through the Iron Interface Group, a division of Dynalysis Corporetion, 3938 Meedow Brook Road, Minneepolis, MN 55426.

Jim Shultis
Advertising Communications Inc.
Bloomington, Minnesota

## Cleaning Up After WordStar

Volume 1 Number 10 contained several letters from reeders who have gone through the seme frustrating experiences with WordStor as I have. MicroPro would not give me any informetion over the phone, either. As a result, my company has stopped using WordStor; it was costing us too much time and money in phone calls.

It is our new policy not to get too firmly entrenched in one company's product without an alternative. We now use Edix and Wordix for our word processing needs because they ere easy to use (unlike WordStor's cryptic Ctrl key sequence) end the menufecturer will talk to me on the phone if I heve e problem.

Unfortunetely, when we made the switch to the new software, our old files creeted by WordStor could not be reed because WordStor sets bit 8 active for some characters for hyphenetion. We wrote a conversion program (in the C language) that strips off bit 8 and restores all characters to ASCII, which most word procesing programs will use.

This program is eveileble from us for $5, which covers our media, packaging, and postage costs. Send a check to Micro Development Inc., P.O. Box 780-B, Lake Oswego, OR 97034, end ask for the *WS2ASCII* program.

Ed Sawicki
Micro Development Inc.
Lake Oswego, OR

## Words on Winchesters

You do e disservice to your reeders by publishing articles such as "Hard Disks Made Easy" by Winn Rosch (Volume 1 Number 10). His lack of objectivity regarding competitive offerings in the removable hard disk cartridge marketplece end his inexperience with current Winchester disk drive technology are evident.

For instance, the flying height of a Winchester heed is meesured in millionths, not thousendths of an inch, and e heed crash typically occurs efter a period of time, depending on the effectiveness of the air-conditioning (filtering) system used in the head-disk assembly.

Rosch's stetement that e smeller heed-positioning mechanism enables faster data access makes no sense, and he mekes no reference whatsoever to the importance of cartridge interchangeability between drives. No mention is made of the effects that bearing and spindle wear may heve on long-term ebility of the system to accurately position the heed. Only a drive with pre-recorded servo information using a precision voice-coil actuetor is presently cepable of performing these functions reliably, and Rosch did not even mention its menufecturer or tbe Genie implementation in his comparison.

If tbe author checks his notes he may find thet the Genie 5x is not the first 5¼-inch removeble drive eveileble, since the supplier of thet drive ignored some of the seme design criterie thet SyQuest elected to ignore, and hes not shipped a working model to Genie.

On the other hend, the Genie 5+5 (5M fixed/5 removable) has been eveilable in production quantities for end users, deelers, and systems houses since December, end it uses technology end feetures that successfully eddress the critical issues in removeble Winchester design.

It is unfortunete, elthough understendable, that advertisements for uneveileble or nonworking products can appear in your publication since planning and layout must be done months in advance. But to give the stamp of approval to any product by publishing a supposedly euthoritetive article is unfeir to your reeders end to competitive companies marching to the beat of a different drummer.

Bob Richard
Golete, Californie

Winn Rosch replies:
*It is unfortunate that in his hunt for errors Bob Richard missed the major thrust of the article, which was to introduce a valuable new technology to a nontechnical audience and to make potential users aware of cartridge Winchester drives as a realistic alternative for mass storage.*

*Richard does make valid points. Interchangeability of cartridges between*

**"Personal Data Base is exactly the kind of program my customers need for the IBM PC."**
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*Ed Coudal, software reviewer and writer*



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CIRCLE 455 ON READER SERVICE CARD

# Letters To PC

drives of the same system is important—and is claimed by the manufacturers of both systems described in the article. A transcriptional error was made (most Winchester heads fly at 14-18 micro-inches, or .014-.018 thousandths of an inch) but the comparison to the size of contaminants and the necessity of excluding them are both valid.

At no time did I make a judgment that one unit is superior to another. I cannot make such judgments because I have not tried every drive available.

### Chartman Critiqued

In "Getting More out of VisiCalc," (Volume 1 Number 10), Frank Derfler, Jr. comments on the Chartman graphics program. In the past several months I have used Chartman extensively to chart hundreds of graphs for Strategic Planning presentations. Derfler aptly describes the advantages of Chartman, but here are some other user criticisms and suggested areas of improvement.

The documentation is poorly organized and there are no tutorials, either in the book or on a disk. More detailed, coherent information with the first time user in mind is needed.

Chartman II displays graphs and menus in color. The menus, which are multicolored with a dark blue inverse field, are hard to look at for extended periods of time. As there is no particular use for the multicolor menus, a simple green menu would be preferable. The graphs are shown in three palettes only, which limits the versatility of the color display for stacked bars, for example. I am so irritated by the multicolor menus and restricted capability of the color graphics that I have disconnected the color monitor and now use a monochrome display.

Additional desired charting features would be filled-in (surface) line charts, plotting a bar and line chart together, floating titles, optional numbers inside the pie chart, and horizontal and vertical grid selection.

The menus are easy to use, but are slow when making modifications. After getting up to speed with the program, I would like to take some shortcuts.

Elizabeth F. Young
New York, New York

### 3 Views of "Eight Ledgers"

There is an error in the article entitled "Eight General Ledgers for Small Business" (Volume 1 Number 10), in the description of the IBM (Peachtree) *General Ledger* program. The authors state on page 162 that this program is not for service companies because the income statement uses a fixed format containing a cost-of-goods section.

That is not true. There is a wide degree of latitude permitted in formatting the income statement as well as the balance sheet, and the user has complete freedom in the development of his chart of accounts. Locally, there are at least three law firms and two service companies currently using the IBM *General Ledger*, each using its own individualized chart of accounts, and none of which is using a cost-of-goods section.

Ronald H. Peacock
Port Charlotte, Florida

I enjoyed reading "Eight General Ledgers for Small Business," and hope you continue to print this type of software review in future issues. Our company will consider the shortcomings and strengths of these packages in our future development, which should benefit the developers as well as the users.

The issue of lack of security seemed to be a common thread in all the reviews, and it is important to direct attention to it. However, in a PC environment it seems to me that the point was overstressed. The software industry can barely control the protection rights in its own development, let alone attempt to protect the user from the biggest security risk of all—himself.

Peter B. Hilgeman
President, Computer-Time Corporation
Morrison, Colorado

Thank you for Steve Yoder and Sherry Knight's article, "Eight General Ledgers for Small Business." We are in the market for an accounting package, but after reading their article, we are going to save our money and wait for something better. Keep up the good work.

I would like to make one compleint about all accounting packages I have seen so far: Where is the revolving charge option in your A/R module? Much of retailing revolves around monthly payments (Visa, MesterCard, Sears, etc.). If a software house wants to capture the hearts of retailers, it had better come up with a way to handle monthly payments without putting the customer past due.

Richard L. Strohkirch
Gladwin Pro Farmers Supply
Gladwin, Michigan

### Unsolicited Testimonials

As a neophyte computer user who not so long ago thought that RAM was a four-legged animal with big horns, that serial was a weekly television show, and memory something you lost when you got older, I want to take the time to bring attention to Spectrum Software Company of Sunnyvale, California. I purchased its *Personal Finance Master (PFM)* for a mere $75, and not only received a powerful, useful program, but individual attention and help.

If any of your readers are considering purchasing a program to handle their finances, either at home or in a small business, I strongly recommend Spectrum Software's PFM. It is exceptionally easy to use and has many excellent features. The accompanying documentation is clearly and concisely written, and, if




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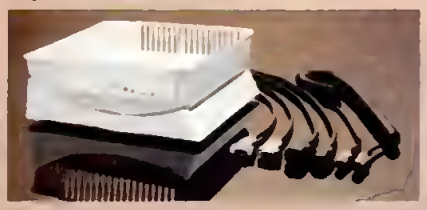
Split screen demo is for ad purposes only

CIRCLE 382 ON READER SERVICE CARD

A lot of quality products from companies like Visicorp, Ashton-Tate, IUS, Hayes, and Corona Data Systems have made life for the IBM PC user a whole lot easier. And more productive.

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Because now, thanks to our PC Pedestal™, you can "tilt and swivel" your IBM display, instead of your body. No more bobbing and weaving to avoid glare. No more neck and eye strain. That means you'll pay a lot more attention to what you're doing, then to how uncomfortable you're feeling.



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# Letters To PC

necassary, staff peopla will politely and cordlelly help you over the phone.

Allen F. Natalla
Almagordo, New Mexico

If you are looking for e good data base program, I would like to recommend one that is reasonably priced. PC-File by Jim Button of Bellevue, Washington, is an excellent program with many possible applications. Tbe author is vary responsive to questions and open to suggestions on how to improve it.

One of the things I like about PC-File is that it is one of saveral user-supported programs available. If you like it you ara asked to send whatever you feel it is worth to the author (a minimum amount is suggested but not required), and you are encouragad to copy it and distributa it to others.

To receive a copy, just mail a disk with a self-addressed postage-paid mailer to Jim Button, P.O. Box 5786, Bellevue, WA 98006. If you prefer you can send a $35 prepaid order, in which case Button will supply the disk, postage, and mailar. Included on the disk is a complete operations menual for the program.

L.W. Summers
Milwaukia, Oragon

## Busy Signal

I have just finished reading the review of *Answer* by Mark Phillips (Volume 1 Number 10). Unfortunately, I do not feel that this review is complete.

*Answer* claims to be a type of database, but in my opinion its capabiiities are limited. As edvertised, this program is excellent if you wish to utilize your computer as e Rolodex card file. Otharwise, the more fields you use in the program tha more bogged down it becomes. As e medical doctor, I find tha program very slow and almost useless in bolding summaries of patiant accounts.

I also find the browsing command very confusing, and the program does not work if you enter tha first initial of the last name and then ask it to "find."

I must compliment North Amarican Business Systems for its telephone support, which was excellent. The staff was willing to help with a minimum of waiting time. However, I did not appreciate their empty promises of "updates" thet were going to be out "naxt month." I am still awaiting the report generator that was originally going to be distributed "no later than" December 31, 1982.

Phillips did not mantion the sort utillty, which I find the most interesting part of the program. According to tha program Instructions, you must sort all entries after you have entered new information. In the configuration that I used, I was abla to store epproximately 150 eccounts in each disk. I deplored using the sort utility, since I knew when I askad *Answer* to go through its double-phasa sort that it wes time to sit down for dinner with my family. Ask *Answer* to sort and your waiting time is 15-30 minutes!

Dr. Jeffrey Faldman
Torrington, Connecticut

Mark Phillips replies:
*Answer's sort routine never took longer than one minute while I wos reviewing it. It does, however, toke longer with increased omounts of stored doto.*

*North Americon Business Systems does not morket the product os on oll-purpose dotobose monager, but rother on "informotion orgonizer."*

## Flanagan Was First

I'd like to correct an ineccuracy in the news item "The Litarary Life," which appeared in PC-Communiqués (Volume 1 Number 10). *Blind Phoroah* by Burke Campbell, was not "the first completely electronic novel."

*Blind Phoroah*, which first appeared on The Source on November 17, 1982, was preceded by my electronic novel, *Mylor's Warp*, which went public on The Source on October 19, 1982.

Subscribers Intarasted in a quick review of the world of alectronic litarature can find it by typing Public at the commend prompt while on The Source.

Thenk you for helping to get the facts straight.

Floyd Flenagan
Long Beach, Californie

*Thonks for stroightening us out. To reod more obout Mylar's Warp by Floyd Flonogon, see PC-Communiqués in this issue.—Ed.*

## Send a Lifeboat

I enjoyad "Fiva C Languege Compilers" by Hanno Hinsch (Volume 1 Number 10), but it is unfortunate that the author did not tast and critique the Lattice 'C' compiler advertised by Lifaboat Associates in the same issue of PC.

It would be helpful to know how this compiler compares with thosa dascribed In the article, aspecially since Lifaboat Associates claims that it is a full implamantation of C.

Allen C. Miller
Sunnyvele, Californie

*Coming soon. For more informotion on Lattice C, see the following letter.—Ed.*

Raading your recent article, "Five C Languege Compilers," reminded me of my days at the University of Missouri in Columbia, Missouri, where the seniors used to tell the freshmen thet the five top drinking schools in tha U.S. were Oklahoma U., Kanses U., Iowa, Ohio Stata, and Arkansas. How about ole M.U.? Wall, it seams Missouri couldn't compete because it wasn't fair to rank a professional with the amateurs.

Just for the record, Lattice Inc.'s C, sold exclusively by Lifeboat Associatas for the IBM PC and othar MS-DOS and CP/M-86 systams, is a full implamentation of Kernighan and Ritchie's C languaga. The runner-up's benchmark time

# Letters To PC

was 74 seconds, making Lattice C 78 percent faster. The runtime of the sama program was 10.5 seconds for Lattice C compared with the runner up's 15.0 seconds, giving Lattice C a 43 percent edge. The size of the .exe file creeted by the program wes middle of the pack—19,504 bytes against an averaga 18,739 for tha five compilers reviewed.

Lattice C, which never assesses a royalty on programs generated using its library or compiler, has hundreds of satisfied customers. For more information contact Lifaboat Associatas, Departmant C, 1651 Third Avenue, Naw York, NY 10028, (212) 860-0300.

Todd Katz
Lifeboat Associates
Naw York, New York

## C-ing Red

"Five C Language Compilers" (Volume 1 Number 10) wes excellent. Henno Hinsch did a commendable job of describing C and evaluating tha five compilars. His article should be required reading for anyone wishing to use C lenguege on the IBM PC.

My company, Logical Systems, develops specialized software. We usa many languages and assemblers, and work on many different types of microprocessors. Having C aveileble for the PC will make much of our software transportable from other machinas to tha PC. Aftar reading Hinsch's erticle, we were plenning to order several of the C-compilers, and this is where wa ran into e problem.

The article implied thet the C-Compiler manufactured by c-systems is eveilable for $195, and that this price includes e debugger called c-window. When I tried to order this packaga, I was told that it would cost $390, beceuse the compiler and debugger are sold separately end ere priced et $195 eech.

I would heve accepted this answer had I not looked at the c-systems ad appearing in the same issue as the C-compiler article. The ad also implied, to me, that the compiler and debugger were priced as a packaga. C-systems admitted that the ad wes ambiguous.

To add to the confusion, PC:Bluebook In the same issue contained still another description of c-systems' products, end here it was stated that tha debugger was priced at $125. C-systems did not have an axplanation for this, and I cancelled my order.

I was upset by this runaround particularly because I am in the software business, and I could not continue bullding and selling software if I did not have the trust of my customers. The confusion I faced in my dealings with c-systams jeopardizes the trust that the computer industry has worked hard to build.

Thanks for e good magazine, for good articlas like the C-compiler evaluation, and for providing a sympethetic ear.

Charles E. Deiotte
President, Logical Systems
Colorado Springs, Colorado

*We received the following letter from James Eokins, who works in the marketing department ot c-systems and is one of the outhors of its C-Compiler ond c-window Debugger. It should help clear up the confusion described in Chorles Deiotte's letter.—Ed.*

We et c-systems wish to thank Hanno Hinsch for including our C-Compiler and c-window products in his fine article, "Five C Languaga Compilers."

This erticle end soma of our edvertisIng appear to have generated some misunderstendings ebout our pricIng policy for these products.

Although the article indicates that c-window Is includad with the compIlar, this is not the case. The c-systams C-Compiler and c-window have always bean, end continue to be, sold es seperate items. C-window does require the c-systems C-Compiler for its operetion.

The advartisement describing our C-Compiler as "Now witb c-window" has either been discontinued or modified to show that the C-window product is not included with the C-Compiler.

The price for the C-Compiler has alweys been, end remains at this tima, $195. When introduced, c-window was priced at $125; the price is now $195.

Finally, c-systams resarves tha right to cbange its prices and its specifications without notice.

C-systems makes every effort to provide quality, innovetive products, end plans release of other programmer aids In the coming months. We invite furthar dialogue in the programmer community for our combined benefit.

James Eakin
c-systems
Fullerton, California

## Legal Ramifications

I enjoy reading your megazina in bed. Holding it abova my face with both hands helps strengthen tha wrists, but I live with the constant feer that es I become sleepy, tha magazina will crash down on my fece, killing me instantly or causing permanent disfigurement. Volume 1 Number 11 weighad in at two pounds, eleven ounces!

My questions to you are: 1) Are you legally responsible if your magazine injures or kills me? 2) How about my postman? (He's not as cheerful toward me anymore.) 3) With the growth in circulation and the increesed thickness of your magazine, are our netionel forests seriously endengered?

I wish you continuad success.

Robert S. Lindsay
Baltimore, Maryland

*Our ottorneys hove odvised us to onswer os follows: 1) We cannot be held responsible for unouthorized uses of PC Magazine, such os body-building. 2) Pleose convey our thanks to your postmon for*

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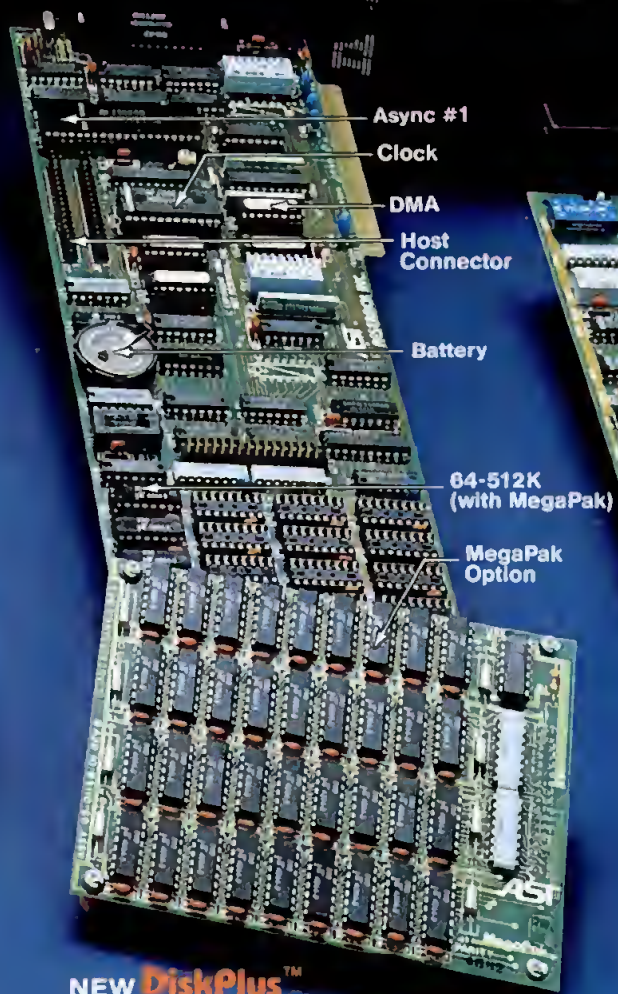
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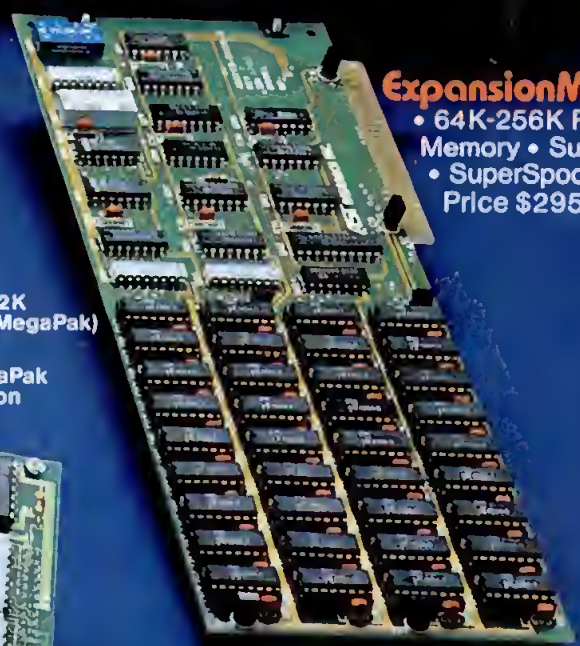
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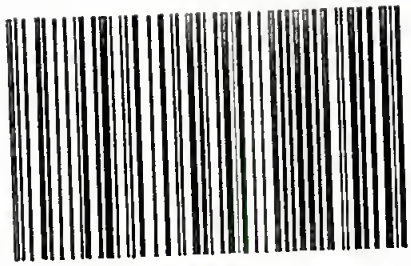



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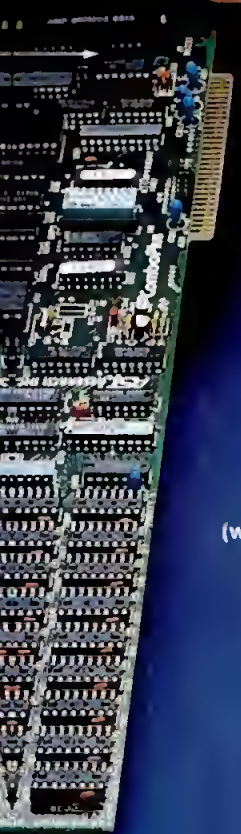
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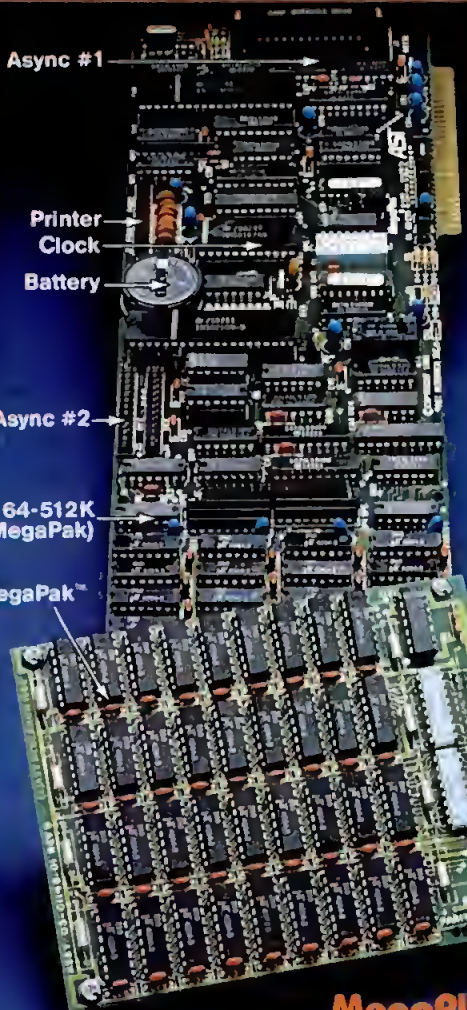
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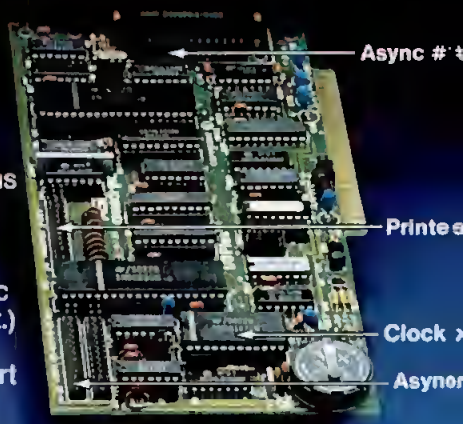
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# Letters To PC

*shouldering his part of the burden; we're sorry if we've come between you. 3) We're told that trees are a renewable resource. We love trees, we think. Being from New York, we've never actually seen one.—Ed.*

## Farmers' Market

I read with interest your item on Homesteed's Form Monogement System, "chosen the best farm menagement software program by the Illinois Ferm Bureeu in 1982" (PC-Communiqués, Volume 1 Number 10). Could you provide the eddress and any other deteils of this orgenization?

Ted Clark
Owen Sound, Ontario

*For information on Farm Manegement System, write the Homesteod Computer Compony, 2530 Crowford Ave. #317, Evonston, IL 60201, (312) 864-6777. Also see "Computing Down On The Form," in this issue.—Ed.*

## Key to the Problem

Concerning "Keyboerd Ketestrophes" in Quebec (Letters to PC, Volume 1 Number 11): Put me on the list. In my case, however, I've found e solution.

I use en old Conrec video monitor, government surplus, complete with homemade cabinet. I heve done a certein emount of modifying end edjusting to get e sharper imege. While I was trying out a new edjustment, the keyboard started to enter rendom numbers onto the screen. Feering the worst, I checked everything, including the line voltege. Of course, everything was perfect.

Then I noticed that I hadn't repleced the CRT grounding spring, the long spring that brushes the back of the CRT and loosely atteches to the chessis (end elways gets in the wey when you heve to pull the chessis). When I reettached the ground spring, the problem vanished and never came back. It may weii be touring Quebec et this very moment.

I hope this provides e solution for some "keyboard katestrophe" sufferers.

Joe Cerioll
Huntsville, Alabama

## Happy With APL

I heve been very pleesed to see numerous articles releted to APL in the mlrcocomputer litereture in the pest few months. Like meny other APL buffa, I welcome the lenguage to the micro with open erms.

Robert S. Lee's review of STSC's APL*PLUS/PC ("PC APLication," Volume 1 Number 11) wes well done. STSC's APL is everything Lee seid it is end perheps more.

My APL history goes back to 1968 when I wes ettending Pratt Institute and IBM was giving APL ewey free to universities. At thet time, APL hed a 32K workspece, no formetting, end no file system. We used a 10 cherecter per second IBM Selectric terminel thet could be heerd on the next floor. The power of APL was overwhelming even then.

I have seen meny enhencements of APL over the yeers, but whet STSC hes done with its APL on microcomputers is the ultimate enhancement. I have been using this APL on my TRS-80 since it wes released last year. This is e very fine implementetion, but it is severely limited by the mechine.

The IBM PC version, on the other hend, is limited only by the user's lmagination. It is better in meny respects then meinfreme end minicomputer APLs I use, and it is by fer the most professional implementetion I beve seen.

APL has truly found e home on the IBM PC, and will prove to be e very useful tool for progrem developers.

George F. Weiss
Red Benk, New Jersey

## Mono-mania

I enjoy your fine megezine, but I have one generel compleint. My PC has a monochrome screen. I use it largely for word processing, and the monochrome works great. But many of your excellent programs, reviews and articles require color/grephics, so I can't use them.

Volume 1 Number 10 included "Kaleidoscope" end "How to Build a Computer Maze." Fantastic! But I need monochrome versions, please. Previously, you've printed gemes and graphics, ell requiring color/grephics. I do like to have fun, end e monochrome screen can do lots of things. Can you please place more emphasis on monochrome screens or print progrems that work in either color or monochrome? Please conaider monochrome users!

Terry F. Pettijohn
Marion, Ohio

*We hove no bios ogoinst monochrome disploy odopters or their owners. However, the monochrome disploy odopter does not drow graphics, ond os such is not copoble of the sort of foncy pictures thot con be produced by the color/graphics cord for the IBM PC. But keep reoding PC, we've got some orticles coming thot will put o smile on your foce (ond your monochrome screen).—Ed.*

## Support for Starwriter

In her review of *WordPerfect* (Volume 1 Number 11), Lindsy Van Gelder gives the impression thet the F-10 Sterwriter Printer is not supported.

Leedlng Edge, the U.S. dlstributor for the Starwriter, informa me that the F-10 was desigined to use the same commend set es the Qume Sprint 5, whlch is supported by *WordPerfect*. I have hed the opportunity to use the F-10 with meny text-processlng programs, and I heve elweys found the Qume Sprint 5 configuretion to work for the F-10 as well.

# BEYOND THE DREAM

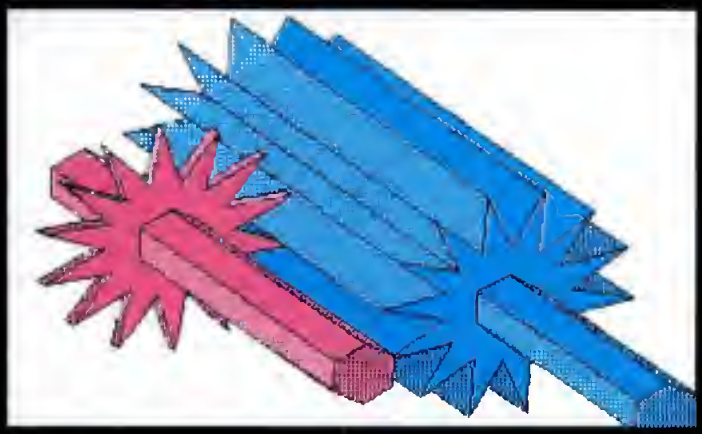
## Imagine creation . . . Imagine the power . . .

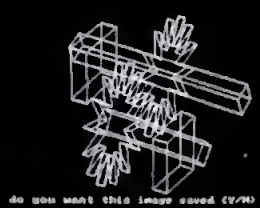
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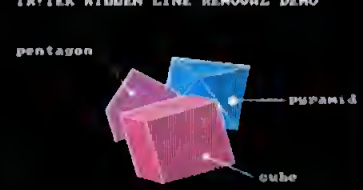
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CIRCLE 488 ON READER SERVICE CARD

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CIRCLE 464 ON READER SERVICE CARD

One can only speculete as to why this information is not includad in tha Starwritar manual, but it should be useful to other Starwriter owners.

Frederic Woodbridge Wilson
Neptune, New Jersey

## Can't Wait for PC

As executive editor Corey Sandler stated in Volume 1 Number 10, *PC* has become an "assantial paripheral," so much so thet I can hardly wait to get my hands on aach month's "book." When is *PC* going to start erriving to us charter subscribers in a more timely manner?

John B. Williams
Des Moines, Iowa

*Port of the problem involves the sheer size of PC. We're working on it, though, ond we think you'll be pleosed with our product ond our punctuolity in coming months.—Ed.*

## Clubs for Kids

I am considering starting e computer club for children (age eight and up) who hava eccess to en IBM PC. Does anyone have information to halp point me in tha right direction?

Saymour Manello
Rochester, New York

*For general odvice, see "How to Stort o User Group" (Volume 1 Number 10). Is there anyone out there who hos storted o group for children? We'd like to hear from you.—Ed.*

## How To Write To PC

Pleasa mark on tha outside of the envelope the department you ere writing to, whather "Lettars to PC" "User to User," "PC Tutor," "PC-Communiqués," or "Club News".

Sand Naw Product announcements to: "New on the Market" et the same eddress, clearly merking the department on tha envalope face.

## How to Write For PC

Wa'd vary much like to hear from writers and users who heva storlas to share with tha readers of *PC Mogazine*. If you are sanding in a manuscript, please be sure to indicate on the face of your envelope, "Article Submission." If you wish to discuss story ideas or submit an outline, pleese mark the envalopa in tha seme wey.

Menuscripts should be typed or printed on white peper, double-speced, with paregraph indents of five characters. Do not hyphenate words and do not justify copy. Please put your name, address, and phona number on paga one of the manuscript, end includa your name end a page number on every page. Include full information on manufacturers' eddress, prices, hardware and software requirements and special notes at the beginning of articles.

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Program listings submittad for consideration must be provided on disk.

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—New York, NY 10016

## Corrections

The address for Dregon Dete Systams, menufacturers of *PC Porrot*, was inadvertently omitted from "Tha PC Talks Back" (Voluma 1 Number 11). The address is: PC Parrot, Dragon Data Systems, 1068 Homer Street, Suite 110, Vancouver, British Columbia V6B 4W9 Canada.

Tha telephone numbers of tha Software Company of Australia have changed since thay appeared in the article "Tie Me IBM Down, Boys" (Volume 1 Number 11). The naw numbers are: New York, (212) 846-1142; Melbourne, (613) 347-7447.


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Adding a printer to your computer makes sense. But deciding which printer to add can be tricky. Do you settle for a printer with limited functions and an inexpensive price tag or buy a more versatile printer that costs more than your computer? Neither choice makes sense.

Here's a refreshing option—the new, compact STX-80 printer from Star Micronics. It's the under $200 printer that's whisper-quiet, prints 60 cps and is ready to run with most popular personal computers.

The STX-80 has deluxe features you would expect in higher priced models. It prints a full 80 columns of crisp, attractive characters with true descenders, foreign language characters and special symbols. It offers both finely detailed dot-addressable graphics and block graphics.

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CIRCLE 157 ON READER SERVICE CARD

opy ght ma ·nal

# PC-Communiqués

*A compendium of facts, news, opinions, gossip, inside intelligence, speculation, and forecasts about IBM Personal Computers.*

## Osborne Befriends the PC

Adam Osborne, the patriarch of portability, has ennounced that his spanking new Executive I suitcase-model computer will soon have an add-on 8088 board thet will turn the Executive I into an "Executive II" and run IBM PC software.

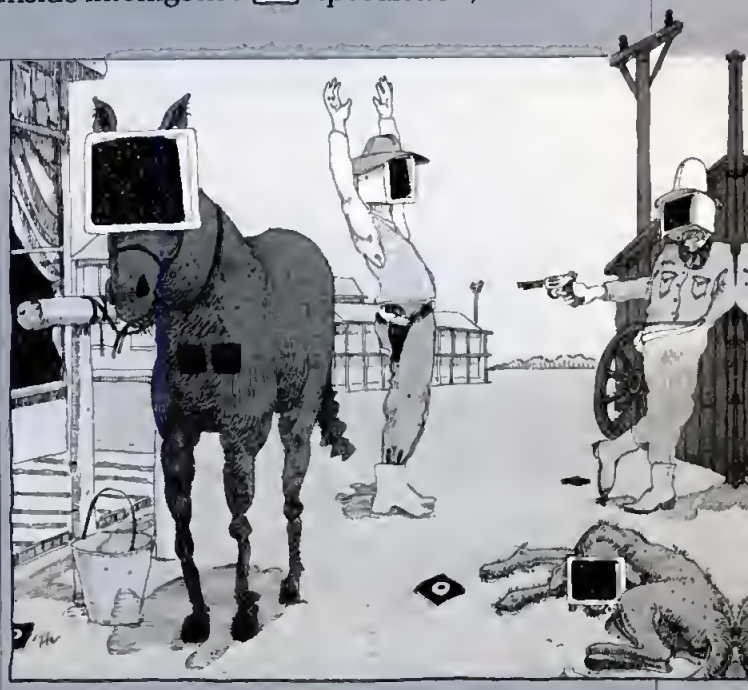
The Executive I is a flashier version of his original Osborne I, with a snappy 7-inch 80-column capacity amber screen, two single-sided half-height 5¼-inch disk drives, 128K of RAM, and the same old 4MHz Z80 CPU. It will cost $2,495 to carry one home, and another $600 or so to make it IBM-compatible.

The Executive I comes with $2,000 of "free" softwere, including WordStor 3.3. The company won't say when the PC work-alike Executive II will hit the stores, but industry experts predict thet it will be ready this summer. Osborne said he wanted to "fill up the warehouses with Executive IIs" before announcing they were available. Some observers think he's actually still polishing the 8088 card.

Kaypro's Andy Kay wasn't worried. "Osborne's moving out of the low-priced market he created. He wes going to bring his Osborne I out at $1,595 and later ran it up to $1,795. Now he's selling only a slightly improved machine for $700 more, and its screen is still 2 inches smaller than ours." Kay also pointed out that you can now buy his Kaypro with a 10 megabyte hard disk and $2,800 worth of "free' software for—you guessed it—$2,800. And he's working on an IBM-compatible version too, although he admits Osborne beat him to the punch.

The eponymous Mr. Osborne told PC that he thought the Executive II would heve so much impact that it would prevent others who were thinking of producing PC clones from proceeding. Fat chance. Manufacturers are all out there at this very minute finding ways to jam an 8088 into every printed circuit ever made. We're waiting to hear about the first PC-DOS-compatible ebacus. Stay tuned.





## Our Town

No, ComputerTown isn't a place where Spencer Tracy gives wayward young micros a new start in life. It's an organization with worldwide affiliates seeking to bring computer literacy to local communities.

ComputerTown was founded in 1979 by the People's Computer Company in Palo Alto, California. This nonprofit center offers introductory and intermediate classes in the San Francisco Bay Area and creates specielized workshops and courses for organizations and businesses.

The Palo Alto group has shared its experience with the rest of the world through its ComputerTown *News Bulletin*, introductory books, and a series of small guidebooks. So far three guidebooks have been published: a *Glossary of Microcomputer Terms*, *Microcomputer Q & A*, and *A Bay Area Guide to Computer Stores*.

Over 250 businesses and groups (including schools, clubs, and scout troops) throughout the world have become ComputerTown affiliates. The Palo Alto center aids its affiliates with information, including a 200-page *Implementation Package* filled with advice on setting up computer literacy projects in their communities.

To become a citizen of ComputerTown, send $25 for a year's Personal Membership (only $15 if you're under 16); you'll receive the bimonthly *News Bulletin* and other services and discounts. ComputerTown affiliates can be started by sending $50 for e school or community group membership or $100 for e Commarcial Membership.

ComputerTown might not be on the map, but it can be reached at P.O. Box E, Menlo Park, CA 94025, (415) 323-3111.

# PC-Communiqués

## Express Software

Enclosing product offerings with monthly bills is not a new practice; credit card companies rarely let a month go by without including soma offer designed to entice customers into painlessly increasing the size of their next monthly bill. Now, American Express, with 15 million card holders on its billing lists, is taking a serious look at a new wrinkle in product offers: software.

One company, SoftLink Corp. of Santa Clara, California, acknowledges that it has talked with the credit card giant regarding inclusion of its software products in an American Express mailing. SoftLink markets encrypted versions of leading software for $49.95, allowing customers to "test drive" a program before paying the balance of the program's full price.

## Evil Aliens Control IBM?

*PC Magazine* was unable to confirm the lurid report screaming from bold headlines in *The Digitol Tottler* (price: "2 Bits") that "Evil aliens from a distant galaxy have taken over the world's largest computer cnmpany . . . and are bent on using their strange powers—including telepathy, mind control, and devil worship—to wreck the computer industry."

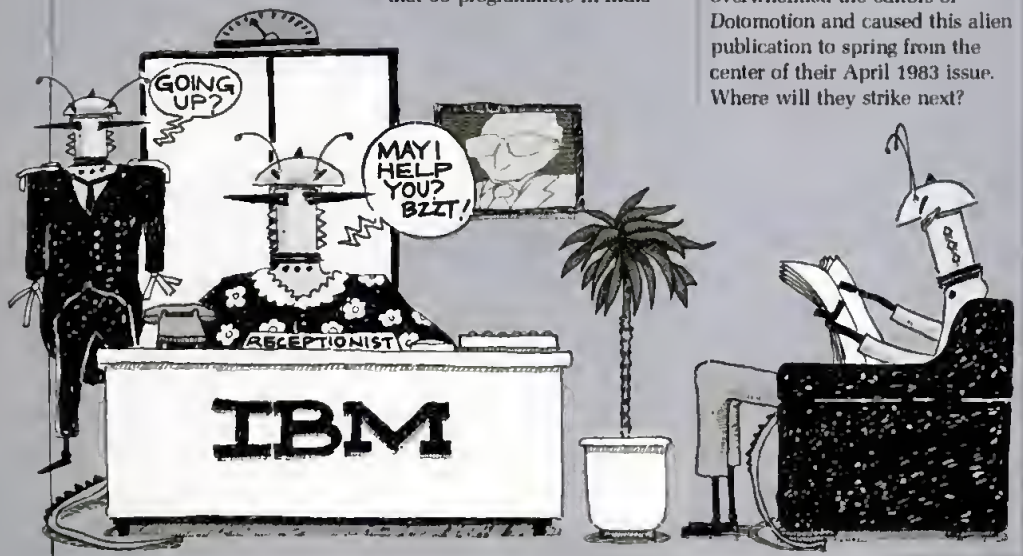
This alarming "exclusive," under the bylina of one Freddy Smarm, is bolstered by a four-colnr photngraph on page one showing three day-glo flying saucers descending on the IBM headquarters in Manhattan. Most Naw Yorkers, apparently distracted by King Kong's most recent shenanigans atop the Empire State Building, failed to notice the invasion.

The Smarm piece quotes an unidentified expert that the aliens "come from the planet Ziploc:, where there is no such thing as morallty as we know it. I wish it weren't true, but it is. . . . They're going to market floppies that let you talk to the devil. They figure they'll sell lika hotcakes, and Satan will tell people to do weird things like offer their electronic banking cards to strangers. It's going to be chaos if they aren't stopped!"

This April 1, 1983 issue of *The Digitol Tottler* also revealed that 39 programmers in India were killed by a miscoded subroutine while running an after-hours football betting pool.

On the human interest side, an article titled "Ordinary People Tell How They Use Their Personal Computers" noted that Mrs. Vera Farber, of tha La-Z-Court Trailer Park in Lima, Ohio, uses her Apple II to keep track of how often her husband mows tha lawn.

*PC Magazine*, which is obviously missing some big stories, has not been able to locate subsequent—or previous—issues of *The Digitol Tottler*. However, we suspect that the *Tottler* itself is a part of the extra-terrestrial assault. Some strange force appears to have overwhelmed the editors of Dotomotion and caused this alien publication to spring from the center of their April 1983 issue. Where will they strike next?




## Warning! Warning! Warning!

If you're walking down the street and notice office wnrkers tossing PC-XTs out their windows in fits of frustration and anger, it's



probably because IBM neglected to include a critical warning on its PC-DOS 2.0 FORMAT utility.

Here's what happens: You painstakingly loaded the contents of 63 single-sided floppies onto the XT's fixed disk—or worse—filled the entire hard disk with brand new information. Later you decide to format a blank floppy disk to back up your data. The system is ready to go since you're already in Drive C: (the fixed disk), so you type in FORMAT. But, say you forget to add an A: to tell PC-DOS where the floppy drive is. The second your finger hits the Enter Key, 10,000,000 bytes of data vanish as the hard disk—not tha floppy disk—formats itself.

IBM should have included an automatic safeguard to pravant this. Maybe a siren and a flashing red light would be appropriate. At least an onscreen message that alerts you tn the possibility of sending all existing hard disk

data into tha bit buckat. And PC-DOS shouldn't allow hitting any single key to start the process; it should make users type in Yes if they really want to go ahead and erase everything.

*Moral:* Back up the hard disk frequently, and be exceedingly careful when using the FORMAT command. Better yet, erase the FORMAT file from your hard disk so that you don't mistakenly use it snme night at 3 a.m. If you really want to be safe, throw a line into your AUTOEXEC.BAT file that says ERASE C:FORMAT.COM.




## You Are Cordially Invited. . .

if you are interested in submitting software to *PC: The Disk Mogazine*, a pamphlet titled *Softwore Submission Plon* is now available explaining its standards and procedures.

*PC: The Disk Mogozine* is a naw publicatinn dedicated to axpanding and diversifying the software libraries of subscribers. Companies, groups of authors, and individual authors are welcome to make submissions. However, all submissions must meet certain requirements before they are published. These are explained in detail in the *Softwore Submission Plan* pamphlet.

To assure quality, the editors of *PC: The Disk Mogozine* first review a "Software Submission Agreement" before daciding if they are interested in marketing the snftware. If they are interested, they will contact the author(s) to request the program code and documentation fnr further evaluation.

This evaluation can be rigorous. The editors may conclude that modifications are required in the submitted program. The time required from submission to publication is expected to be 3 to 6 months. Details of program modifications, royalties, and advances are contained in a software contract to be provided by tha editors.

*PC: The Disk Mogazine* plans to publish software ranging from specific applications to stand-alone programs, utilities, and subroutina libraries. Naturally, all submissions must be original and must operata on the IBM Personal Computer.

For more information or to request a Software Submission Agreement, write to PC: The Disk Mogozine, Author Submissions, Department 732, One Park Avenue, New York, NY 10016.



## The Adventures of Mylar the First

As some subscribers to The Source already know, *Blind Phoroah* by Burke Campbell was not the first completely electronic novel ("PC-Communiques," PC, Volume 1, Number 9). Campbell's book came in a close second to *Mylor's Wnrp*, a science fiction work by Floyd Flanagan.

*Mylor's Worp* can be read on a home computer screen by anyone who subscribes to The Source. You can hold your place with an "electronic bookmark" or print the pages of the novel. The story contains all the elements of sci-fi, plus a few from the world of computer games: cryogenic presarvation, electronic domination of the world, an erotic ideal named Sugar Cube, warring generals with deviate armies, and super power beams. These and other varieties of future shock are experienced by Johnny Mylar, a modern-day man hurled forward in time.

"This new electronic approach could have a profound impact on the publishing industry, and perhaps on literary tradition," says Floyd Flanagan. Perhaps. Perhaps not. Flanagan is, aftar all, planning a traditional paperback version of his novel.

# PC-Communiqués

## Jetting with the Micro-Set

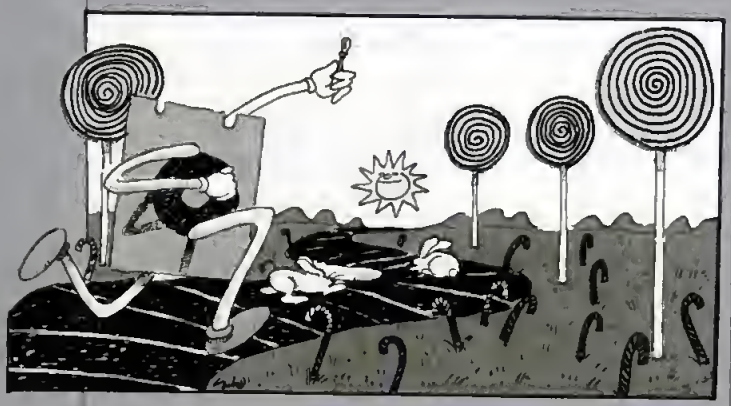
Are you a computer show addict? If you are, and fear you won't be satisfied by hitting Atlanta for Comdex Spring, San Francisco for Comdex Fall, and Miami for Interface Age, don't despair. There's another world of computer shows on the Pacific Rim that can keep you supplied with information, contacts, glitter, hype, and fatigue.

In October you can indulge in a mad spell of island hopping to keep up with the industry. The Japan Electronics Show in Tokyo (October 6–11) overlaps with the Taiwan Electronics Show in Taipei (October 10–16) and Seoul's Korean Electronics Show (October 11–16). Next stop, Kowloon for the Hong Kong Electronics Show (October 16–18). You come full circle back to Tokyo, for the Computer Data Show (October 18–21).

After this grand tour, your eyes might be too red from jet lag to ever stare into a CRT again. But just think of the pleasure you'll have telling stories at all the domestic computer shows next winter—over a hot cup of saki, of course.

## PC-Communiqués Pays

Do you have naws, gossip, or unusual computer tales for PC-Communiqués? Wa will pay up to $50 for each submission usad. You must include your nama, address, and telephona numbar with tha item. We will preserve your anonymity if you wish. All submissions become the property of PC and are subject to aditing. Our User-to-User section also publishes and pays for raadars' submissions; that section featuras tips, problem solutions, and short programs or routines. Plaase send submissions to the appropriata dapartment—PC-Communiqués or User-to-User—at PC, Ona Park Ava., New York, NY 10016.



## Mother Goose Goes Digital!

It's true. Spinnaker Software Corporation of Cambridge, Massachusetts, recently announced that Dale Disharoon (great name!) has developed a line of IBM PC-compatible kiddieware called *Hey Diddle Diddle*. The collection of 30 classic nursery rhymes features both music and color graphics, and "helps childreo undarstand how words and rhymes create poetry," according ling to Spinnaker.

Which is all fine. We approve, assuming that Disharoon didn't yiald to a temptation to update the lyrics. It wouldn't do to teach a oew generation of nursery rhyme lovers that the disk ran away with the spoon.

## Goliath 2, David 0

Since the success of fBM's Parsonal Computer has gone from being a speculativa opinion to a fact of the marketplace, many companies have been inspired to offer similar microcomputers at somewhat lower prices. As long as fBM's price is higher, these smaller imitators are likely to find ready buyers among bargain-conscious computerists.

How long can small manufacturers hold their ground against the Big Blue giant? A parable of their coming fortunes might be found in the tale of Magnuson, a company that came up against fBM in the mainframe arena.

Magnuson was started by a group of engineers with tha bright idea of designing a systam that was "plug compatibla" with the fBM 370. They succeeded, and came to market with a comparable, more reliable computer priced about 15 percent less than IBM's.

Before Magnuson could sell many of its more-for-less mainframes, IBM announced its new 4300 series computers with prices that came down to meet Magnuson's level. The small newcomar tried to maintain its competitive edge by cutting its prices evan closer to tha bone. Now, according to *The Jeffries Report*, the conclusion to the Magnuson story can be read in Chapter 11 (the bankruptcy act).

Manufacturers of PC work-alikes should take care not to use lower price tags as their only shield against Big Blue's clout. Many competitors must already be shaken by fBM's 15 percent price cut for the PC, following tha announcement of its XT. The giant struck its next blow by permitting its National Accounts Division to offer greater discounts on high-volume orders from corporate customers.

In the computar marketplace, the old riddle still holds trua: Where does a giant sit? Anywhere it wants to.

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PC TUTOR/MARK ZACHMANN

*Have you wondered if your present software will be compatible with PC-DOS 2.0? This question, and others, are answered by the PC Tutor.*

# Looking For Compatibility



## New DOS For Old

**Q:** Now that PC-DOS 2.0 is available, should I switch to this latest version? I know that this operating system has a lot of nice new features, but I already have quite a lot of software that uses DOS 1.1. Which programs will or won't work on the new system?

Several Readers

**A:** For the most part, software that runs under PC-DOS 1.1 will run under PC-DOS 2.0. Software written for PC-DOS 2.0, however, might not run under DOS 1.1. PC-DOS 2.0 contains a number of very useful system calls that I, as a software author, would hate to ignore. You should expect that some new software may be restricted to use with PC-DOS 2.0, as the programs will depend on those new calls.

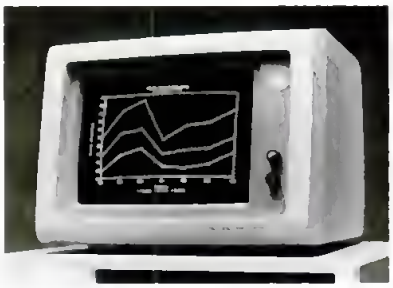
PC-DOS 2.0 supports hard disks and nonstandard video display adapters much better than PC-DOS 1.1 does. Under PC-DOS 1.1, manufacturers had to modify the internals of the operating system to get a hard disk to work; the result was a hodgepodge of incompatible hard disk systems. I would expect that most hard disk systems are rapidly being converted to PC-DOS 2.0; for some systems, it may be a requirement.

Much upcoming software and hardware for the PC will be restricted to PC-DOS 2.0; to use these you'll be forced to purchase the new operating system.

As to incompatibility: there are a few software packages that will not run under PC-DOS 2.0. My discussions with IUS (the makers of EasyWriter) indicate that EasyWriter II will not run under PC-DOS 2.0. According to the IBM manuals, EasyWriter 1.1 will run with DOS 2.0, but the BPI accounting package and the PeachTree accounting package (Version 1.00) will not run under DOS 2.0. I have not seen any other older programs having problems when run under version 2.0; most popular software has been checked out.

The problems you are most likely to encounter with PC-DOS 2.0 lie in memory constraints. If your PC has only 64K of memory, then some programs may run out of space, because PC-DOS 2.0 requires an additional 12K or so of memory to run. For example, the IBM Arithmetic Games require 96K under PC-DOS 2.0, as do the IBM Asynchronous Communications Support Program and Fact Track.

PC-DOS 2.0 also allows the use of two conveniences that could take up additional memory. With it you can set up disk buffering and can use the ANSI.SYS device driver. Disk buffering will speed up some programs, but the price is that each sector buffer takes up 528 bytes. Arbitrarily, I tend to use 18 buffers, which require a total of about 9K in RAM. The ANSI.SYS driver lets you redefine function keys easily, but it also takes up space. The amount of memory it requires is undocumented; the total probably depends upon what



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keys you redefine.

When using these enhancements, programs might not leave as much space untouched as before. Programs which formerly required 64K may require 96K. Programs which required 128K may require 196K. If your memory is tight on space, don't use the BUFFERS or ANSI.SYS options in your CONFIG.SYS file.

If a program does some unusual things with the disk drives, then you may also encounter trouble. The definition of one operation system call has been redefined in PC-DOS 2.0: call number 1B. If your program tells you how much space is available on a disk, then it is a sure bet to encounter trouble with version 2.0.

The layout of higher capacity disks (the 9-sector disks which provide 360K on a double-sided disk) is changed for PC-DOS 2.0, so programs which read the disk directory directly will have problems. Also, because PC-DOS 2.0 supports so many different types of drives, any program that expects only single- or double-sided disks can easily get confused by provisions for alternative drives.

Another problem lies in the use of trees. PC-DOS 2.0 has the ability to partition your disk into groups of similar files, called subdirectories. In programs written for version 1.1, however, you cannot access files in other subdirectories. This change may make you decide to avoid using subdirectories altogether, but don't

**BY USING PATHS, you can run a program from one subdirectory while residing in a different subdirectory.**

forget that you still can copy a file from one subdirectory to another. Also, by using paths, you can run a program from one subdirectory while residing in a different subdirectory.

The new trees, piping, and redirection features have removed a few characters from the valid file name set. If you have files written in version 1.1 that include names with the characters <, >, |, or \, then you need to rename the files before you try to use them under version 2.0.

Some new features to watch out for include the BREAK ON. You can use this to break out of a program that does very little character input or output; but the program may not be prepared for you to

**BE VERY CERTAIN that you use an input file that will handle all the expected questions.**

use that ability. In the same vein, it appears that the PC-DOS 2.0's print calls now offer you an "Abort, Retry, or Ignore?" question, rather than the old "Printer Fault" message. This gives you a chance to abort from the middle of a critical program. With older programs, however, it is probably safer to correct the error and key in R for "Retry."

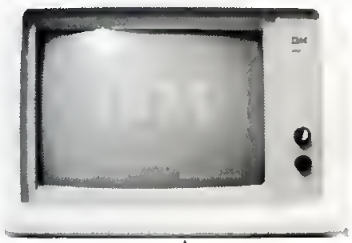
Also, some previously unused areas in the program segment prefix are now used by PC-DOS 2.0. If your program relocates itself there to reduce memory, or uses some of that area for a scratch pad, bad things can happen. With this sort of problem, it is hard to say exactly what the result will be.

One of the nice things about PC-DOS 2.0 is that it lets a program permanently allocate memory to a use. This memory need not be contiguous. Watch out for programs (particularly compilers) that will use more than 64K; the memory they use may collide with a workspace resident program (such as a print spooler or RAM-disk) which had already reserved that memory. Note that the RAM-disk which is documented in the PC-DOS 2.0 manual ("Sample Device Driver" on pages 14-27) allocates memory from the bottom; if you use this one, it cannot cause a collision.

Be wary of using the ANSI.SYS program to redefine function keys. If you do this and then run a program which expects function key answers, you may find yourself unable to exit.

A final problem: with Version 2.0 I have been unable to break out of a redirected input. Although the PC-DOS 2.0


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manual claims you can hit Ctrl-Break, this has not worked for me. Since there's no other way to recover, be very certain that you use an input file that will handle all the expected questions. If you leave

***PROGRAMS which perform fancy operations on the diskette will most likely fail under Version 2.0.***

out an answer you may need to reboot.

In short, if memory constraints can be eliminated, most programs which run under PC-DOS 1.1 will still run under PC-DOS 2.0. The primary change in the operating system lies in disk organization, so programs which perform fancy operations on the diskette will most likely fail under Version 2.0.

I like PC-DOS 2.0 a lot, and plan to use it in future software. For C language programmers, the new calls are excellent. It also appears that these calls will be part of Xenix; if so, PC-DOS 2.0 will provide an upward path for software developers.

## Booting Up a RAM-Disk

**Q:** I use *EasyWriter II*. The update which came out in January uses PC-DOS, rather than the program's own operating system. Is it possible to make use of a RAM-disk by calling the auto-execute batch program, rather than booting via Ctrl-Alt-Del?

Paul Segal
Syracuse, New York

**A:** Yes, this should be possible. I believe that EasyWriter 1.1 from IBM (which relies on PC-DOS) will also run under a RAM-disk. I have requested a copy of the new EasyWriter from IUS and expect to be able to start testing it momentarily.

## Foreign Characters

**Q:** I have a need to use foreign language characters while operating WordStar 3.2. Entering the character's ASCII values by pressing the Alt key and the numerical pad does not work. Can you help?

With the amount of foreign correspondence written on word processors these days, I am surprised the question hasn't come up before.

Claude Vacas
Bloomfield Hills, Michigan

**A:** Actually, I have received a few questions about using foreign language character sets. Now that the IBM PC is sold internationally, this should become a very common question, so it is time for a detailed answer.

First, the problem of displaying the characters. As far as I know, the only word processing program which will display foreign language characters is Edix by Emerging Technology Consultants. Other programs, such as WordStar, tend to automatically filter out the top bit that identifies these characters. Unfortunately, Edix must be used with the companion program Wordix to get formatted copy. This combination is less convenient to use than a joint editor/formatter program.

What about printing? Almost any word processing program can print foreign language characters, even though they may

***ALMOST ANY word processing program can print foreign language characters, even though they may look strange on the screen.***

look strange on the screen. This capability largely depends on your printer. I'll discuss how to do this with two printers: the Epson FX-80 and the NEC Spinwriter 3550. You can probably use the same technique if you have a program capable of sending an Escape signal (character 27) and control characters to the printer.

The Epson FX-80 is a very nice dot matrix printer capable of printing most foreign language characters. To get it to print them, you first need to send it the


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string Esc-"I1". In BASIC, that statement would look like:

```
LPRINT CHR$(27)+''I1'';
```

After sending this from BASIC, you can probably even run the editor. From then on, certain control characters will print foreign language characters. If you use an Epson FX-80, refer to pages 3-73 of its users manual. It will tell you, for example, that sending a Ctrl-F (character 6) will print a British pound sign. Of course, this may display as "^F" on your editor. The Epson's foreign set contains accented and umlauted vowels, and monetary symbols.

**CERTAIN control characters will print foreign language characters.**

If you need letter quality printing with foreign characters, then I suggest using the NEC Spinwriter 3550 printer (this printer is also sold by IBM). The 128-character thimbles used by the NEC can contain foreign characters, as well as all 96 ASCII characters. For exomple, the Eurape-A prestige elite 12-pitch thimble contains most of the common Eurapean characters. Convincing the NEC to print any of the thimble's additional characters may not be so easy, however.

The simplest approach is by a method called RAM Thimble Mapping. This may require you to give up a standard character for each new character you use. You might elect to have the { (brace) symbol replaced by the pound symbol. To do this, you need to refer to a thimble mapping chart (available from NEC dealers). This chart shows the position of each character on the thimble. Let's suppose that the pound sign is position 12. Then, to replace { by the pound symbol, you could send this BASIC statement:

```
LPRINT CHR$(27)+"?{"+CHR$(12)
+CHR$(106)
+CHR$(27)+"@";
```

CHR$(27)+"?" initiates mapping mode. This is followed by a three byte sequence for every choracter you wish to have replaced.

The first byte is the replaced character, in this case the brace "{".

The second byte, CHR$(12), is the thimble position of the new character.

The third byte, CHR$(106), contains a value calculated in the following way. The hammer impression level (here I use 6) is multiplied by 16. This is added to the character spacing, as measured in 1/120-inch units: for example, each 12-pitch character takes up 1/12 inch, which is 10 times 1/120 inch. Therefore, the equation to use here is (16*6)+10=106. For 10-pitch characters or proportional spacing, different values would be used. Try different values for the hammer impression level and see what the results look like on your printer until you find how to get the appearance you want. For different characters, the best hammer impression level may vary.

At the end of the thimble mapping sequence, send these two bytes: CHR$(27)+"@". Before this ending, you can put as many groups of three bytes in the middle as you like, to map several special characters at the same time.

You can write a simple BASIC program mapping each character (from 1 to 127) to generate a thimble map. (See Figure 1.)

If you first prevent the printing program from resetting the printer, you can use a small program in BASIC to set up the mapping sequence. Then, when you use the word processor, just remember that some of the characters you key in will be translated into other characters.

The NEC Spinwriter does not use some control characters. Therefore, when you use RAM thimble mapping, if you map special characters onto these control characters, you might be able to retain all 96 ASCII characters.

Note however, that you must map every character you wish to use. Once the

*Figure 1: A BASIC program for generating o thimble mop for the NEC Spinwriter 3550 printer*

```
100 REM PROGRAM TO GENERATE A THIMBLE MAP
110 REM FOR NON-CONTROL CHARACTERS
120 REM
130 REM Select the RAM thimble:
140 REM
150 LPRINT CHR$(27)+"5";
160 REM
200 REM Run as two sets to avoid printing
210 REM control characters:
220 REM
230 FOR J=0 TO 1
240 REM
250 REM Map character I+(J*64) to position I:
260 REM
270 FOR I=1 TO 64
280 REM
290 REM Enter map mode:
300 REM
310 LPRINT CHR$(27)+"?"
320 REM
330 REM Map a character:
340 REM
350 LPRINT CHR$(I+32)+CHR$(I+J*64)+CHR$(106);
360 REM
370 REM End map mode:
380 REM
390 LPRINT CHR$(27)+"@";
400 REM
410 REM Print the character:
420 REM
430 LPRINT CHR$(I+32);
440 NEXT I
450 NEXT J
```

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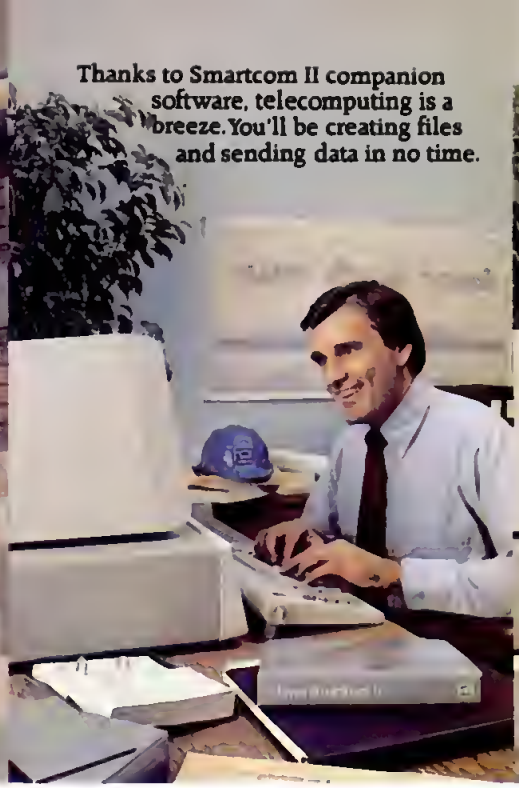
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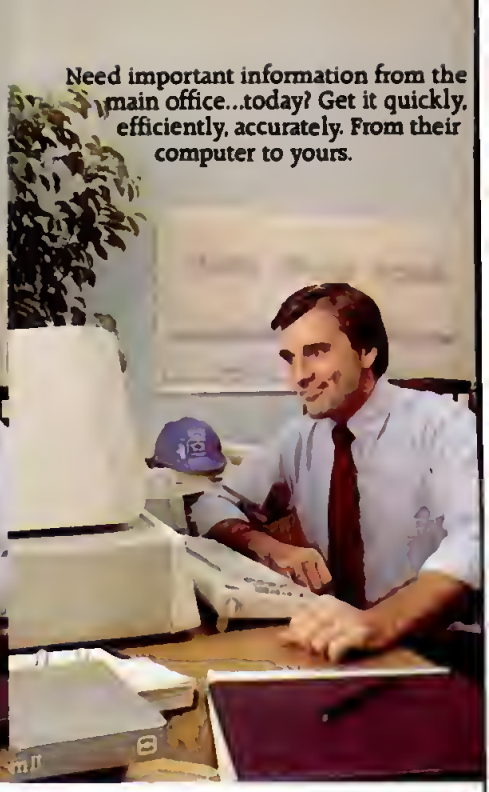
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*NEC printer has received a command (Escape 5) to begin using the RAM thimble, it will look to the RAM for all characters. You therefore need to know how to map every single character.*

*There is, for a price, a much easier solution. The Final Word, by Mark of the Unicorn, is a word processor program that makes this whole process very simple. I would suggest that you at least try the program out if you have a desperate need for foreign language characters.*

*YOU MUST MAP every character you wish to use.*

## Toggling Control Keys

**Q:** A demonstration of the IBM PC convinced me that this is the computer I need. But I have not purchased one because I am unable to use the IBM keyboard.

To access all of the characters on the keyboard, a user must press the shift key, the Ctrl key, and the Alt key at the same time as other keys.

Because of a physical disability, I am unable to press more than one key at a time. This problem could be overcome by software which would convert these keys into toggles, such as the CapsLock is now. Since writing software to do this would require a knowledge of assembly language, which I know nothing about, I would appreciate any help.

Dal Vordahl
Spokane, Washington

*A: Two approaches towards solving your problem spring to mind. You could use a routine that is called by the clock interrupt (user interrupt 1Ch) to check whether or not a key was pressed. If so, it then toggles the keyboard status word at 0040:0017. This word contains bits which indicate to the keyboard routine whether the Alt key, the Shift key, or the Ctrl key are depressed. The problem with this solution is that it can only be used with programs which will not attempt to read characters too quickly.*

A second, more viable approach, is to write a small program that will replace the usual keyboard interrupt (interrupt 16h). When this routine is called to provide a keypress, it should check to see if the last key pressed, say the Alt key, is actually a signal that you wish to have

**BECAUSE OF A physical disability, I am unable to press more than one key at a time.**

locked. For example, when the program asks for a character, it might detect that you have pushed the PgUp key. This could be a signal that all keys pressed from then on are control keys, until the PgUp key is pressed again.

The difficulty with writing this routine is that it will require a fair amount of logic to handle all of the various possible combinations of pressed keys. For example, suppose you had requested Alt mode and then pressed the left arrow key. Well, PC-DOS does not understand a character corresponding to Alt-left arrow. Despite the potential for confusion, the latter approach is probably the most effective.

For another look at computers and the handicapped please see "Helping the Handicapped Through Computers" by Dona Z. Meilach, in this issue.—Ed.

## Timeout for Buffers

**Q:** I use an IBM-PC to run packaged programs, such as WordStar and VisiCalc, as well as programs that I write myself. I use a printer with a very large buffer of 12,000 characters. The buffer fills OK, but thereafter it takes data in blocks, causing the IBM to display a "Device Timeout" error message about 8–10 seconds after handshaking begins. Can you tell me any easy way to control this?

Jim Rogers
Orange, California

**A:** What you need to use is the MODE program that comes with PC-DOS. If you read the PC-DOS manual concerning MODE, you will find that there is a P option for printers that causes PC-DOS to never make a timeout error. By entering MODE LPT1:,,P, you say that you want continuous retries for line printer 1. If you use redirected I/O (i.e. with a serial printer), then you would enter this instead: MODE COM1:1200,e,,,P. This sets the COM1 line to 1200 baud with even parity. This would be followed by an instruction to redirect the printer to COM1, say by writing MODE LPT1:=COM1.

Adjust the values to suit different ports or different baud rates.

## Munching Matrices

**Q:** I have encountered a particular problem with the FORTRAN compiler for the IBM PC that does not appear to be addressed in any of its documentation. I need to work with a number of large matrices at the same time, so I wrote a program to do heavy number-crunching. My code compiled fine when I asked for data areas less than 64K, but the program would not work at all for areas of more than 64K.

I was looking forward to using the 8087 chip for number-crunching, but now I find that IBM's versions of Pascal, BASIC, and FORTRAN suffer from that same memory limitation. Can you recommend a way around this dilemma?

James Horkovich
Xenia, Ohio

**A:** It sounds to me as if you should investigate the APL*PLUS/PC interpreter produced by STSC, Inc. (see "PC APLication" in PC Volume 1, Number 11). It is the only compiler/interpreter I know of which will support more than 64K of data and the 8087. Note that it does have a 64K restriction on data object size.

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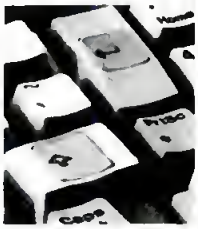
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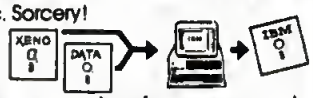
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speed of interpreted APL is equivalent to (or faster than) a compiled language.

I hope that IBM releases a new FORTRAN compiler that does not contain these deficiencies, but there have been no reports of plans to do this. Not only does IBM's FORTRAN handle no more than 64K, but it also lacks double precision.

***THE APL*PLUS/PC interpreter will support more than 64K of data and the 8087.***

## Mysterious Lines

**Q:** I seem to be having difficulty with BASIC. I get syntax errors in lines that are perfect; when I retype the lines, everything works fine. I also have written lines which refuse to be inserted. Even when I use the BASIC command to renumber the program, these lines will show up at the wrong place, out of order.

I also seem to be able to get some duplicate line numbers.

Another problem is with the printer. I use a serial printer and it works fine in everything but BASIC. Is there an easy way to get it to work in BASIC?

Marvin Kanapik
San Francisco, California

**A:** Don't feel alone. I have seen commercial BASIC programs with duplicate line numbers. The problem and its solution are really quite simple, once you know what to look for.

When you end a line in BASIC, a marker is inserted that BASIC uses to tell the difference between two separate lines and one line that is over 80 characters. The marker used is character number 255.

When you have a numbered line that won't go to its correct sequential position, what has happened is that it is part of another line that may be, say, 160 characters long. Take a look at the following example, where I used the # symbol to represent the marker character 255 (the actual symbol is blank).

```
10 REM This seems to be a short line
                                    #
```

If you later enter a program line just

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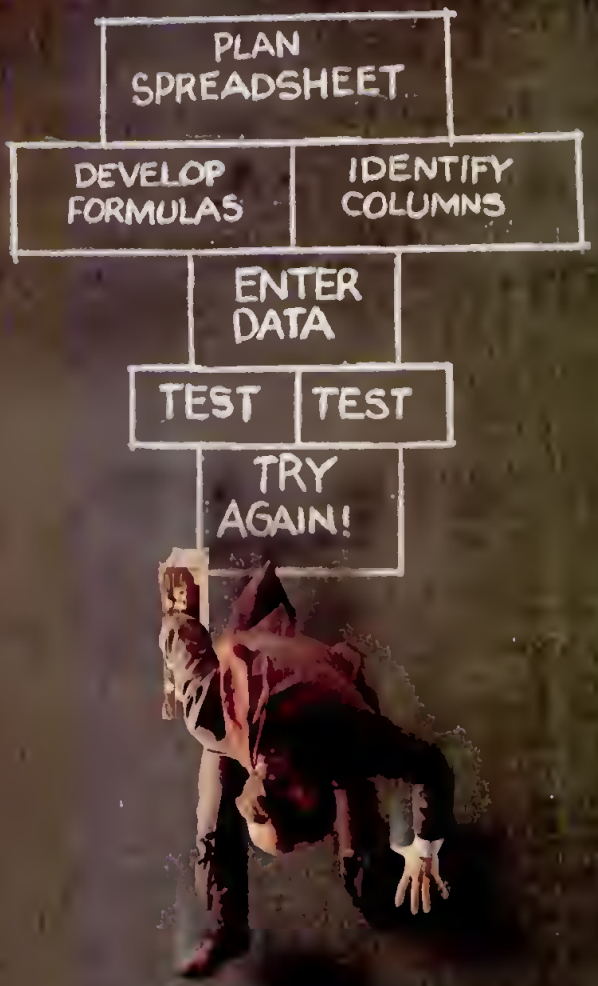
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below the line labelled 10, the new line just becames odditional material at the end af line 10. Far example, suppase yau enter the follawing:

```
10 REM This seems to be a short
line
200 Y=X-4                    #
```

It will laak like everything went OK, but you will find that "line 200" does not exe-

## *I HAVE SEEN commercial BASIC programs with duplicate line numbers.*

cute and will alwoys oppear right ofter line 10, even if you renumber, or type over it. The "200 Y=X-4" is just treated like o continuation af the camment an line 10.

To stap yaurself from falling into that trap, there ore two outs. First, move the cursor to line 10 ond hit the End key. This will move the cursor to the 255 choracter (usuolly blank, but shown as # in the examples obave). If the marker is at the end of the following line, you can see that line 10 is octuolly two lines long.

Another solution is to move the cursor to the line you plan ta type on ond then hit the Escape key ta a line. If it erases existing text, then you stopped yourself fram making o mistake by leaving unwanted choracters on thot line.

As ta yaur problems with printing fram within BASIC: Although you con use the PC-DOS MODE cammand ta redirect printed output to the seriol device, this cammand is nat sensed by BASIC. That deficiency has been carrected in PC-DOS 2.0, so yau might wish ta upgrade. Otherwise, to print from BASIC with PC-DOS 1.1 you must open the COM1 device (like o file) and write to it, just like using file I/O. This is the correct method, but it's extremely clumsy. */PC*

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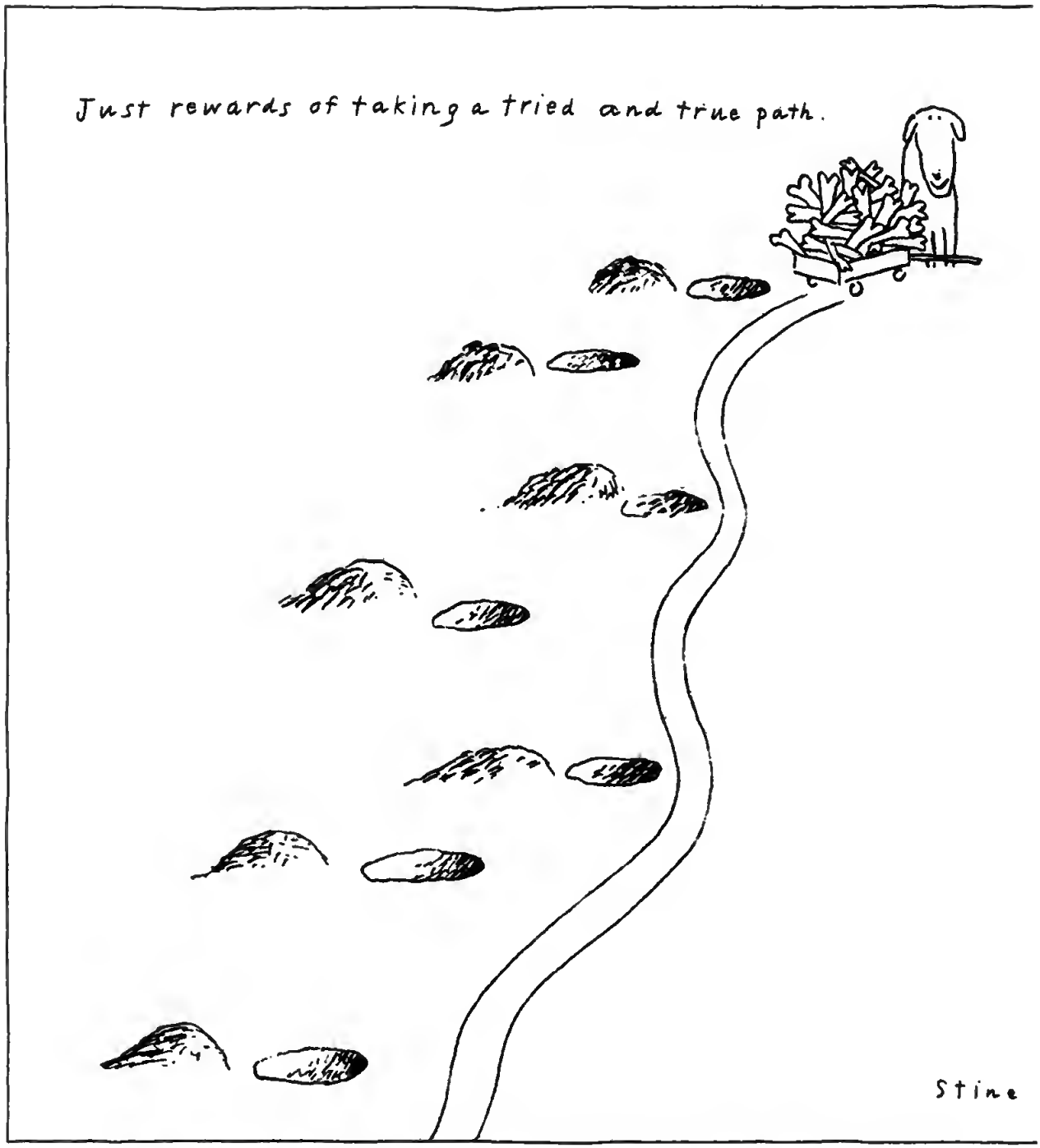
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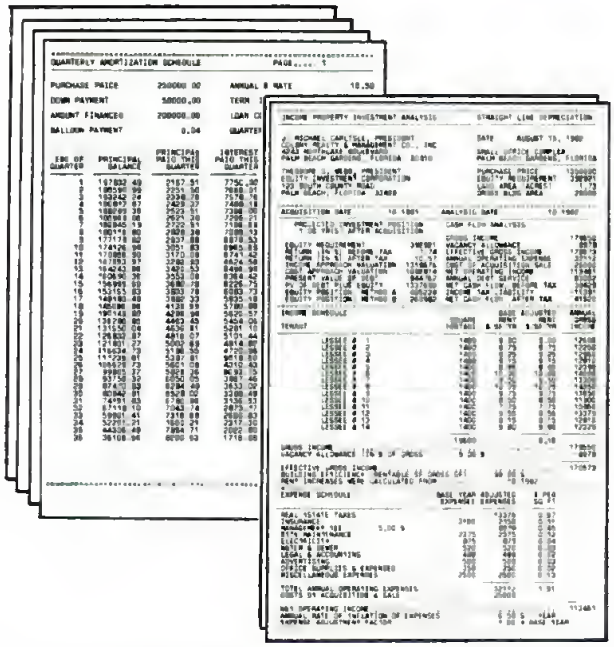



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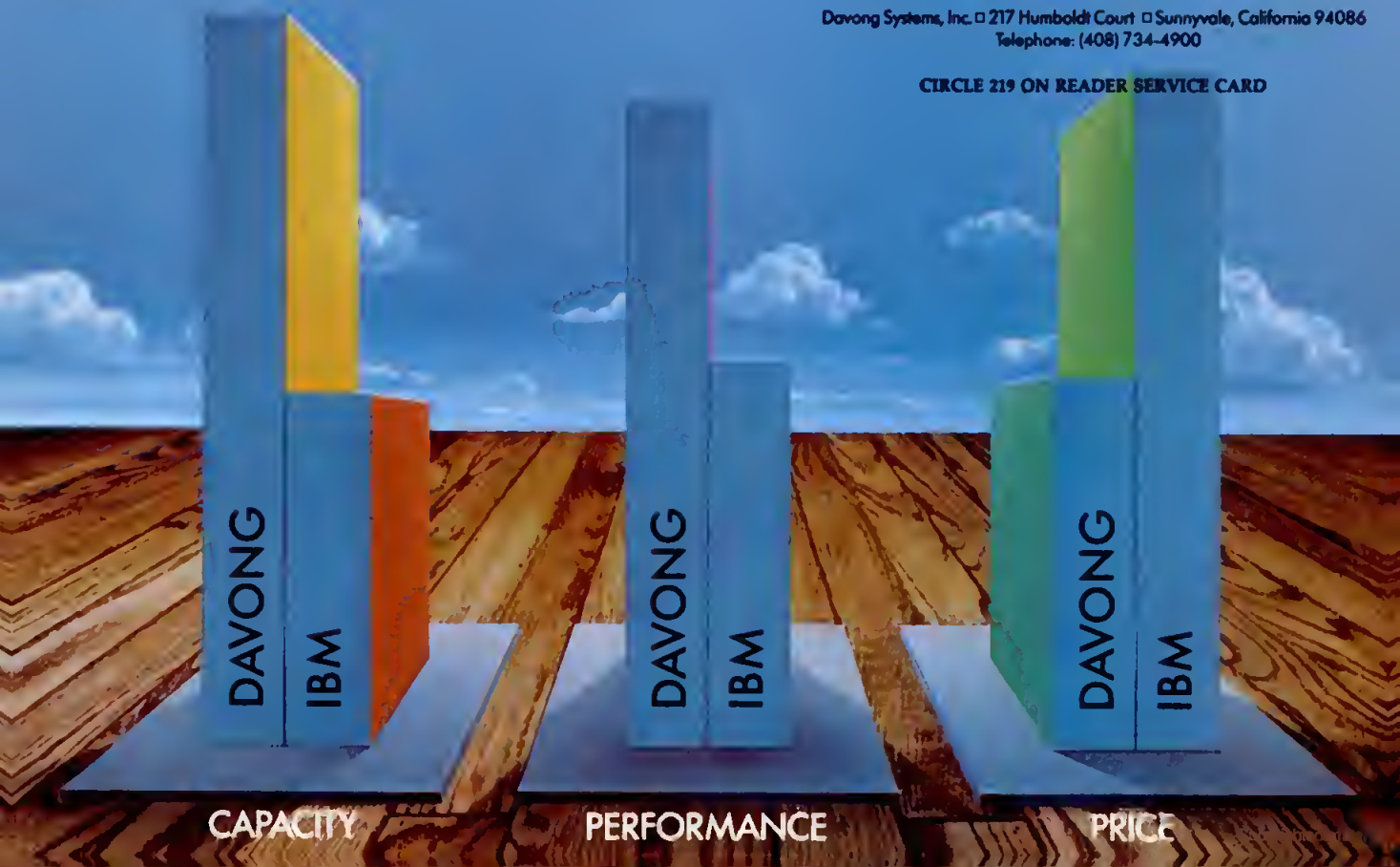
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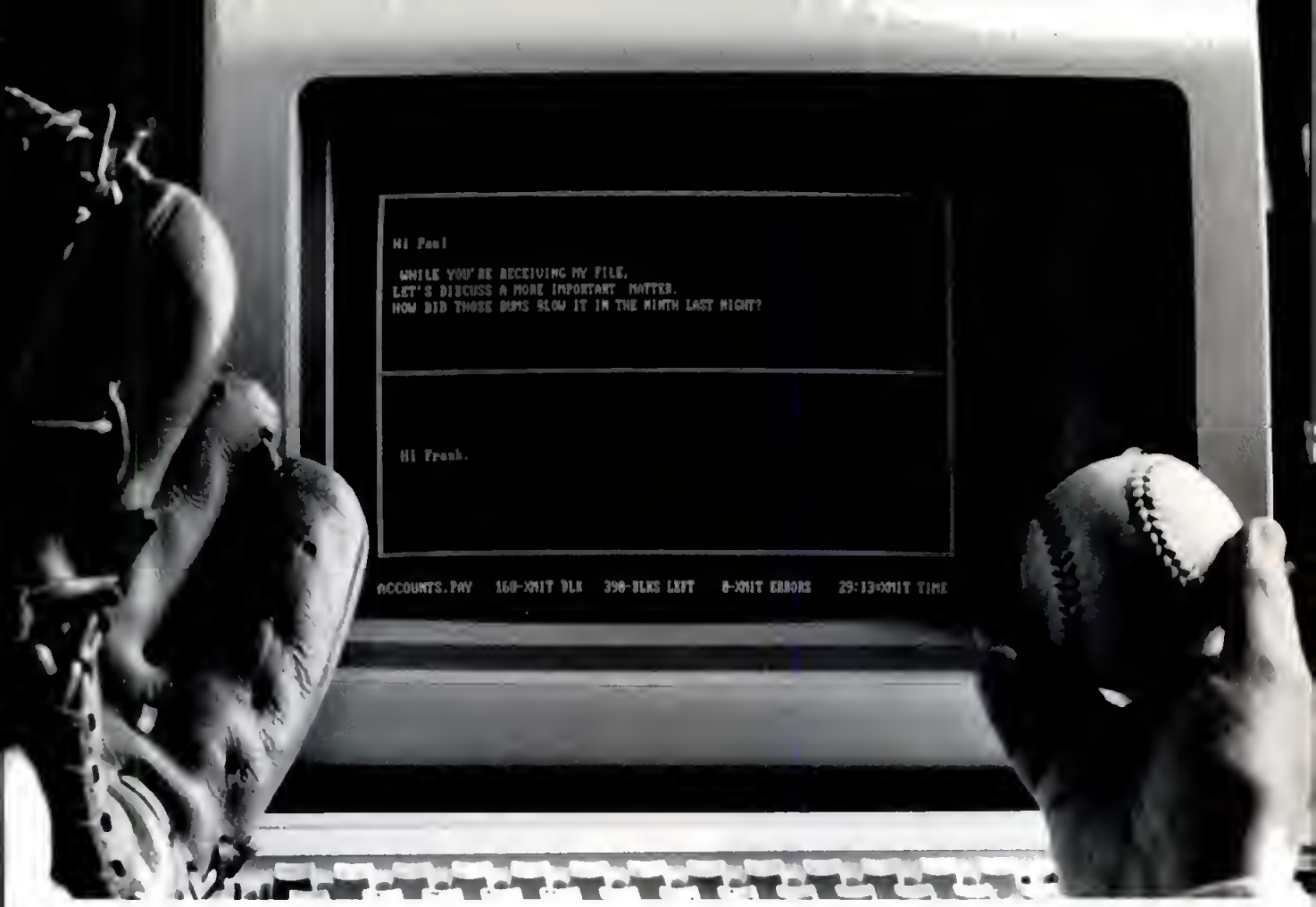
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The exposition portion of PC '83 is the largest gathering of PC-compatible products ever held. You'll find, under one roof, more than 400 exhibits of software for business, professional, home, personal and education applications; plug-in cards for memory expansion, telecommunications, speech and many other functions; hundreds of peripherals, including printers, networking systems and innovative new storage devices; plus dozens of publications, books and invaluable support services.

PC '83 brings together the *entire* PC world.

## RELIABLE AND COST-EFFECTIVE

Think about the different vehicles available for buying software and add-ons for your PC. You can shop at local computer stores, but they usually have a very limited selection of products and a less-than-expert staff. You can buy through mail order—and take some big risks if you get products that don't work or don't do what you expected.

At PC '83 you have the best of all worlds. You can see *all* the different PC-compatible products in one location at one time. You can talk with factory experts rather than just local salespeople. You can 'test drive' each product and decide if it's right for you. And when you find what you're looking for, you can buy it right on the spot.

Best of all, you'll save hundreds—even thousands—of dollars at PC '83. Most of the products shown at PC '83 are sold at special show prices, so you won't have to look hard to find incredible values. And because PC '83 will help you make more informed purchase decisions, you'll end up with products that are better suited to your applications.

## A REMARKABLE CONFERENCE PROGRAM

The conference program at PC '83 isn't just a warmed-over, pared-down version of other computer conferences. The seminars, workshops and forums at PC '83 are the result of months of research and planning targeted toward one specific goal: helping you get absolutely the most out of your IBM Personal Computer.

The program features world-renowned PC authorities speaking at over 100 educational sessions. Seminars provide an in-depth, understandable look at a broad range of PC uses in business, home and education. Seminars emphasize 'how to,' telling you specifically what you need to know—in non-technical language—to use the PC in dozens of different applications.

Forums present an inside look at what's happening in the PC-compatible industry and what new developments you can expect in the next few years.

Software and Hardware Spotlights are a PC '83 exclusive. These workshops address one of the biggest problems that virtually all computer users face: how to decide which software and hardware packages are best for your applications. Each Spotlight provides a detailed discussion and demonstration (with large-screen television) of a group of products, covering their features, capabilities *and* limitations. Experts are on hand at each of these sessions to answer all your questions.

## EASY ON YOUR FEET

We've thought of a lot of details to make your visit to PC '83 just a little more pleasant. As with all of our events, the show is fully carpeted, so your feet won't give out before you've seen all the exhibits.

Our unique Conference and Exhibits Guide helps you quickly find the exhibits and educational sessions you want to attend—even if you can't remember their names. And the Guide is provided free of charge to all attendees.

If you're traveling some distance to attend PC '83, we'll arrange a discounted hotel room near the show site through the PC '83 Housing Bureau. On request, we will also provide information on things to do, places to visit and where to eat in San Francisco and Boston—to make your stay in these grand cities a memorable and relaxing one.

## A TOTAL SUPPORT SERVICE

Let's face it, getting support for your PC is tough. The PC magazines, newsletters, user groups and retailers are certainly helpful. But there are so many different products, services and things to learn about for your PC, what you really need is *one* event that brings everything together in one place in a well-organized format.

PC '83 does it all. It showcases all the PC-compatibles under one roof. It has a complete and comprehensive program of seminars, forums and product workshops. And it's produced with the quality and professionalism you've come to expect from Northeast Expositions.

So if you do anything with the IBM Personal Computer or if you're considering buying one, be sure to put PC '83 in your calendar right away.

Your PC will certainly appreciate it.

## DAILY REGISTRATION FEES

Exhibits-only badges are $8 per day, and the Conference Program is $15 per day.

## SPECIAL PRE-REGISTRATION DISCOUNT

If you plan to attend PC '83 save now with advance registration. Three-day Exhibits and Conference badges are $48, you save $21. Three-day Exhibits only badges are $18, you save $6. One-day Exhibits and Conference badges are $23 and one-day Exhibits only badges are $8.

## ADDITIONAL INFORMATION

To receive additional information about attending or exhibiting at PC '83, including the Conference, Seminar, Workshop and Panel Discussions Program, or information on local hotels call 617-739-2000 or 800-841-7000 (Boston).

## ANY QUESTIONS? CALL 800-841-7000 (BOSTON)

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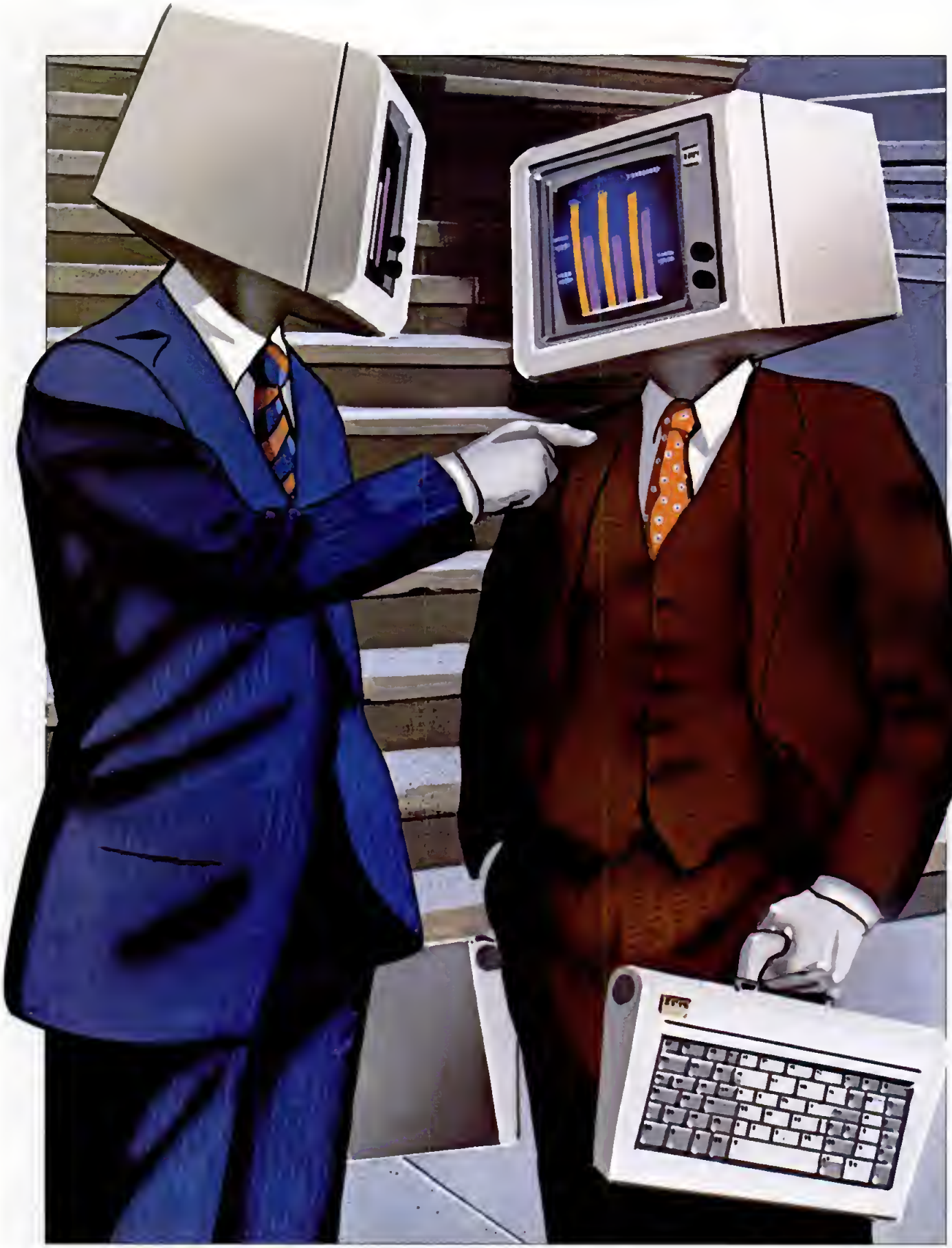
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```
***FILE NAME TO READ: B:trade
111
- 111 STOCK WATCH -
- Last-Sale Prices -
- 02 55 PM EST  4/07/83 111262
#   STOCK   CURRENT CHANGE TREND  LIMIT
1   NCR     105 3/4   -   1/4     DN
2   IBM     102 5/8   -   1/8     UP
3   XON      30 3/4   +   1/2     DN
4   DEC     117 1/2   - 3 1/4     UP     L
5   GD       41 1/2   -   1/2     DN     L
6   WANB     31 3/4   -   1/4     DN     L
7   EFH      47 3/8   +   1/4     DN
8   XRX      40 1/4   -   1/8     DN
9   WCI      27 7/8   . . .       UP
10  JCP      59 1/4   + 1         DN
11  DIS      78 1/2   .....       DN
12  S        35 1/8   +   5/8     UP
13  HWP      76 1/4   -   3/4     UP     L
14  CBS      66       - 1 1/2     DN
15  BAL      33 3/4   +   1/4     DN

*** END OF PAGE--TYPE THE RETURN KEY TO PROCEED
```

*This Trade*Plus screen shows the current stotus of o portfolio of securities. It ollows you to quickly compore the current price with the price you paid for the stock. This detoiled listing is not updoted while it is on the screen.*

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The Trada*Plus computar provides business-orianted reports on your stock portfolio; the reports includa the fects and figures referred to as the fundamentals. Thase are not the dateilad bistorias end graphs usad by tha group of trader-analysts known as "chartists," who look for petterns in the history of stocks and try to predict the future from tha past.

```
*** FILE NAME TO READ: B:buffer2

*** TYPE NUMBER TO SELECT.. 211
- 211 BUY OR SELL STOCKS -

***  Type Stock Symbol. . . . . .IBM
     INTERNATIONAL BUSINESS MACHINE
     Last-Sale Price is. . . . . 103
***  Type (B)uy or (S)ell. . . . . .B
***  Type Number of Shares . . . . . .100
***  Type (M)arket or Bid Price . . . . .101 1/2
***  Type (G)TC, (D)ay, (S)top Buy . . . . . .G
     (C)ash, (M)argin, (O)ption
     (S)hort, (X)eogh, (T)HA
***  Type Account (C,M,O,S,X,I). . . . . .C
***  Type (B)ill or (D)ebit Fund. . . . . .B
***  Type (H)old or (D)eliver Cart. . . . . .D
***  Type Password. . . . . .XXX

YOU MUST STAY ON-LINE FOR CONFIRMATION

***END OF PAGE--TYPE THE RETURN KEY TO PROCEED
```

*This is the order form used to enter o buy or sell order. You need o seporate possword to complete this form. The system supplies the lost sole price; to complete delivery you enter the price you wish to buy or sell ot and odd o few other detoils. The price you enter must be within o certoin range of the present price or you can choose to occept the present morket price. The (G)TC option means good until concelled.*

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The Stock Watch feeture on the Trada*Plus manu allows you to watch the deteiled movement of an individuel stock or the price movement of e group of stocks of your cboice. Selecting the Tax Raport from the menu provides you with e summary report, which tells you the current status of your long and short term geins, and a report telling you the potentiel long end short geins end losses you hava in your present portfolio. I found the ebility to know my exact status and to maka "whet if" projections wes mucb more useful than finding out whether e stock hed taken certain dips or leaps in the past.

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## The Broker's Role

Sinca users of this service are, of course, concarned with money, it's worth

considering what Trade*Plus costs and what you get for your money. Keep in mind that the charges for the Trada*Plus services are compaltely separata from any brokerega feas and othar money paid or received in the transfar of securities. Many brokers simultaneously offar their servicas through Trede*Plus. Trade*Plus plans to expand its list of availabla brokers. Any of your business arrangemants relating to esteblishing a securities account will be made with a broker and not with tha servica itsalf.

By viewing how stocks are traded today, you can see where Trade*Plus fits in. When you want to buy or sell stocks, you now probably pick up tha talaphone and dial the number of a brokerage house where you hava an eccount. You esk for the account manager assignad to you and hope that he or she is not busy with another client. This account manager, a representative of the broker, links you with the trading ectivity on the stock exchanges.

When you contact your account manager, you normally ask for soma stock prices, then scribble notes on a handy piece of paper that you mey or may not be abla to find tha next day. If you place e buy or sell order, you have to make another note to remind yourself what you told your account manegar to do.

Your account manager anters your ordar into an electronic system that sends a message to whatever "wire room" the brokaraga house uses. Many brokers share aach wire room sarvice to trim their costs. The wire room sends a massage to the appropriete stock axchenge where your order is executed. Unless you are a special client or have raquested special service, you will laarn the details of the trada only when a statement or other paperwork arrivas in the mail.

### Direct Orders

Trade*Plus provides a communications link been you and the brokerage house, but it must provide more than that to justify its cost, which is highar than the old method of using voica talaphone conversations with a sales represantative. It must provida value-addad servlces.

The primary adventage of Trade*Plus over the telephona system is its recordkeeping capabilitias. Tha secondary advantage is in the service spaed and the availability of more current information.

*Figure 1: This is the actual message sent to a braker by the Trade*Plus computer. The broker will reply with a confirmation message as soon as the trade has been completed.*

```
*** 03:43 PM  4/07/83          IBM          BUY
Exch: NYSE     Ord #:          INTERNATIONAL BUSINESS MACHINE
Qty:   100     IBM
At: 101 1/2          GTC       Acct: 467-1111
                                 Ted Anderson
Special Instructions: Deliver Certificate; Bill Customer
Approx. Value of Order:  $10,150.00
Trade*Plus Id: CL0003
```

When you plece an ordar through Trade*Plus, you actually send it directly to the broker's wire room. (Sae Figure 1.) When the order is executad, a massaga will be sent directly back to you with the details. This transaction is usually completed in about five minutas. You can plece an order, then either sign off the systam and check back later in tha day or stay on the system until the report is returned. Once the report is returned, Trade*Plus eutomatically entars tha data lnto your eccount's filas. Immediately, you can sae the effect of the trade on your portfolio value, what it has done to your tax report, and a log file report that tells exactly what was dona and when.

***I WATCHED IBM move between 101 and 103½ in a period of ten minutes.***

***WHEN YOU place an order through Trade*Plus, you actually send it directly to the broker's wire room.***

### Costs and Charges

Thasa value-addad sarvices are not free; there has to be a profit for the providar of such a servica. To use Trade*Plus, you have to pay a ona-time registration fee to establish an account on the system. Then there ere connact tima fees and a fee to buy the optional Trode*Moster software. If you want the actual last price at which a security traded, you will hava a separate monthly charge for this service from one or both of the major stock exchanges.

The registration fee for Trada*Plus is $100. This fee establishas you on tha system as a user. The connect time charges range from $29 an hour for 1200 baud service during the prime hours in your local time zone (7 a.m. to 6 p.m.) down to $8 an hour during non-prime hours. Trade-*Moster software sells for $200. The American Stock Exchange will charge you $11.65 e month for Last Trade price information, while the New York Stock Exchange chargas $63 e month for similar information from tha "big board."

Obviously, the charges you incur for the usa of Trade*Plus are detarmined by many factors. If you are satisfied by a servica with only closing prices and 300 baud transmission, you can manage a nica portfolio for $8 an hour. Your actual time on the system, evan at this lower spaad, can be as little as 10 minutes to check a portfolio and place an ordar. If you do this onca a waek, you won't evan use up tha $10 monthly minimum service charge. If you want more current data, you must

spend a minimum of $22 an hour to get 20-minute-old prices at 300 baud.

If you have e good terminal program, such es Crosstalk from Microstuf, Inc. or PC/InterComm from Mark of the Unicorn, Inc., you will not need the Trade*Moster disk. When you are figuring the cost of Trade*Plus you should note that you won't need to spend $200 for this software if you already have enother capeble program on hand.

*NEW YORK already can't find enough ticker tape to have a decent parade.*

Certainly, considering the monthly cbarges, only professional portfolio managers would find the Last Trade service economical. Wben I bed e chance to use it, though, I was amazed to see the actual movement in the prices of some relatively conservetive and bigh priced stocks. I wetched IBM move between 101 and 103½ in a period of ten minutes. If you could buy several hundred shares of such e stock, you would pay for a month's subscription to the Last Trede service with one transaction that was pruperly timed to catcb the small price chenge.

### Trade*Master Software

Tbe Trade*Moster software is e communications peckage designed for use with the trading system. Its configuration utility program will customize the main communications program for the system identification, pessword, and initial selection you'll usa on the Trade*Plus servica. You can elso include the telepbone number of your local Telenet entry port; Trade*Moster can command e D.C. Hayes Smartmodem, a Ven-Tel PC Modem Plus, or a U.S. Robotics Autodial modem to dial this number eutomatically. It will then interact with Telenet and sign you onto the system.

Trade*Moster has a very complete sign-on routine. You do not need to do anything after you boot up the disk. It makes communications operations about as nontechnical and invisible as possible.

Typing Ctrl-Z during the operation of the prugram pruvides e menu of options: you can seve the incoming data in a capture buffer, write the buffer to a disk, read disk files, and print disk files. The capture capebility means you don't heve to spend a lot of time on the Trede*Plus system reading and pondering over the deta. You can capture e snapshot of your portfolio in the buffer, write it to the disk, and leave the system. Once you are off-line, you can bring the deta up on the screen or print it out leter for study.

Trade*Moster can be used as e general purpose communications prugram, but it is specifically configured to perform the Trade*Plus sign-on. Crosstolk and other communications prugrams can store your passwords and dialing codes so you can enter e system like Trade*Plus with ebout three keystrokes, but they do not offer the "hands off" performance of Trade-*Moster. They do, however, cost less and bave greater flexibility for use with other systems.

### The Time Has Come

Since the idea of electronic stock trading must have occurred to others, why is Trade*Plus the first such service? Other information utilities sell material goods through special buying groups and on-line stock information is popular, so why has electronic stock trading taken so long to arrive? Every time I asked this question, I got a different answer.

*ELECTRONIC trading could make the entire system of frantic activity on the floor of the exchange obsolete.*

Some experts in the field said that the profession's account managers have killed the idea before, and might kill it again, because they feared losing their jobs. Other observers pointed to the conservative nature of the whole industry. After all, the concept of electronic trading, if carried only a few steps further, could make the entire system of frantic activity on the floor of the exchange obsolete, eliminating the mystique of Wall Street and a lot of jobs. These observers point out that New York already can't find enough ticker tape to heve e decent parade because computer systems have replaced the stock ticker. If you develop direct electronic trading, customers may not need the middlemen.

*IF THE BROKERS smell money, they will break like bulls for water.*

Somehow, Bill Porter prevailed over this logic and made Trede*Plus the first electronic stock trading system for the use of private individuals. It certainly will not be the last.

### Putting Stock in the Future

I think predicting the future of the electronic securities trading industry is easy. Monkey see, monkey do, and devil take the hindermost. If the brokers smell money, they will break like bulls for water.

The impact on the microcomputer industry will be interesting, too. Competition between brokers should lead to improved electronic performance, making deta retrieval and remote interaction more automated and less burdensome.

I believe we will quickly see the "hands off" capebilities of programs like Trade*Moster taken one step further and integrated with software like VisiCalc, dBaseII, and Lotus Development Corp.'s 1-2-3 information management program. If this kind of autometed communications program could be selected for 1-2-3's menu, you could enter Trede*Plus to update your portfolio information, capture it in a 1-2-3 file, and use 1-2-3's manipulation end graphing power on the captured portfolio data. You wouldn't be concerned with the fact that your computer bad just consulted with another mecbine across the country to get the deta.

The microcomputer field is moving towards this sort of integration, and services like Trade*Plus will act like magnets to draw it there. The total information age is coming very quickly. Ticker tape may soon be a thing of the past. */PC*

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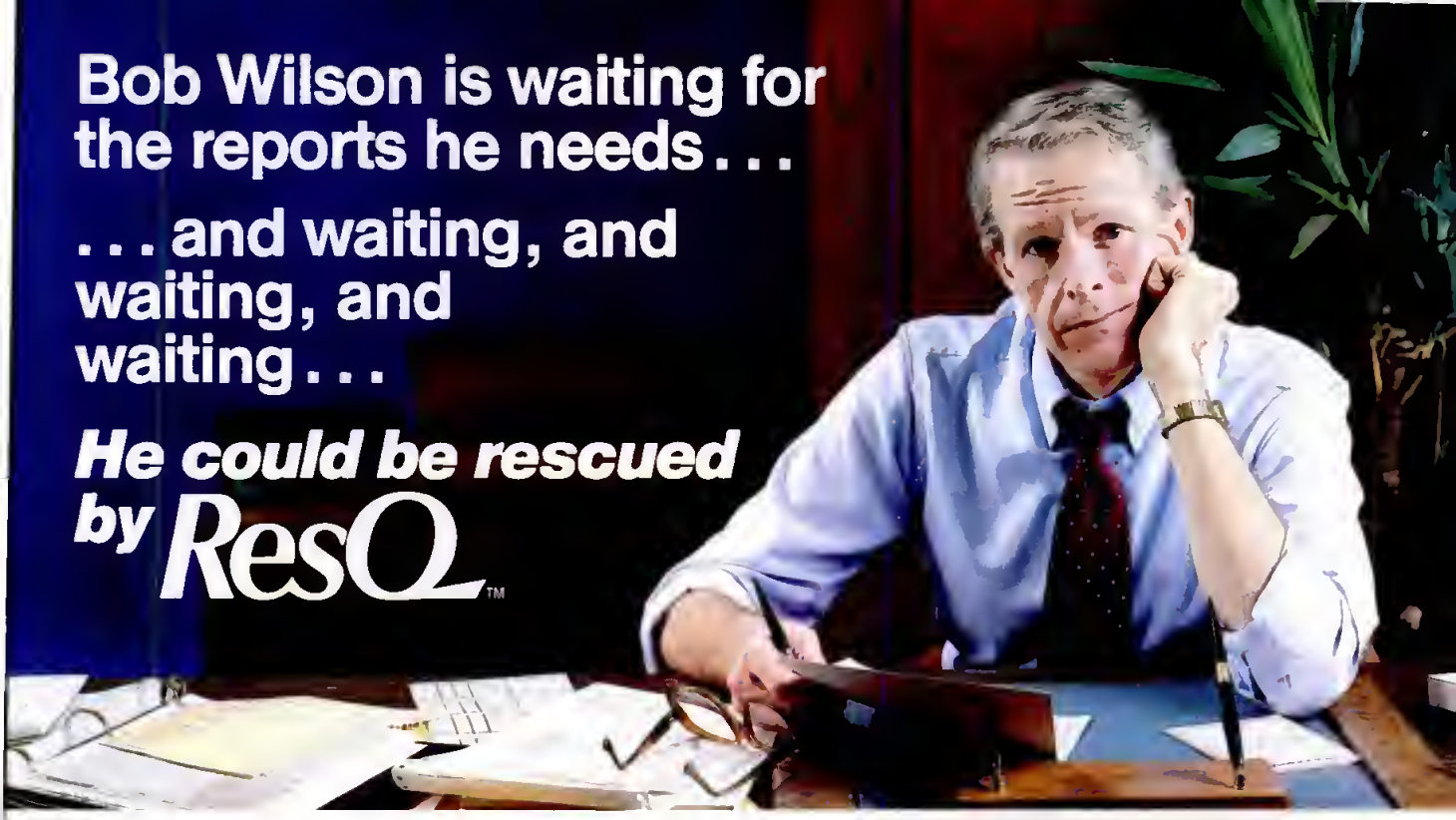
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## ...and waiting, and waiting, and waiting...

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CIRCLE 201 ON READER SERVICE CARD

SOFTWARE/FRANK J. DERFLER, JR.

*This database management system brings many capabilities—and a taste of the pricing—of mainframe software into the PC environment.*

# MDBS THE THIRD: IF YOU HAVE TO ASK THE PRICE . . .

*MDBS III*
Internetional Software Entarprisas
ISE-USA, Inc.
85 West Algonquin Rd., #400
Arlington Haights, IL 60005
(312) 981-9200
**List Price:** $2,800–up, depending on options
**Requires:** 128K RAM, (hard disk recommended).

**CIRCLE 623 ON READER SERVICE CARD**

Why would anyone buy a $9,976 piece of software for a $4,000 computer? Well, as the old saying goes, "You can pay me now or you can pay me leter."

MDBS III is a detebase menagement system, evaileble for the IBM PC in versions priced from $2,800 to naarly $10,000. You could pick up other detebese packagas for a lower price, but you wouldn't gat all the *MDBS III* faatures for any less. This package is a descendent of software used on large mainframe computers. It's powerful enough to move the PC from the world of Personal Computing into the realm of Profassional Computing.

Routines in *MDBS III* provide powerful mathematical functions, encryption, informal queries, caraful filtering and checking of data coming into the database, and the ability to serve multiple and evan simultaneous usars. It was writtan by Micro Data Basa Systems, a softwara research and davalopmant firm, in a mixture of C language end assambly language. Versions of *MDBS* III are eveilable for a wide ranga of machinas (both micro- and minicomputars) and operating systems (including CP/M, MS-DOS, UNIX, and TRSDOS). Applications programs using *MDBS III* can be easily transported between different herdware environmants.

***MDBS III IS powerful enough to move the PC into the realm of Professional Computing.***

If you still are outraged that a program could cost more than the computer thet runs it, consider some of the differences between mainframe end microcomputer software. The total life cost of e typical meinframe system breaks down to 20 percant for the hardware while the software is 80 percent of the prica. Although microcomputers heve not been around enough yaars for us to see what their total lifecycla costs are, it appears that the greater relativa seles volume of software for microcomputars has resulted in a significently different hardware/software price ratio. Some microcomputer companias appear to giva awey software to sell their systems. Microcomputer users are accustomed to finding very powerful programs sold for less than one-tenth of the cost of tha hardware they have.

The microcomputer merketplece has changad more than just the price of soft-

Photograph: Jack Reznicki



*Figure 1: Summary of features of* MDBS III.

| |
|---|
| Number of files: 16 |
| Number of records per file: 65,535 |
| Number of bytes per record: 65,535 |
| Number of fields per record: 255 |
| Multiple data types with checking |
| Checking for "reasonable" data |
| Multi-level Boolean record sorting |
| Automatic record maintenance |
| Boolean update of multiple records |
| File merging capabilities |
| Encryption |
| Security passwords |
| Portable to other hardware |
| Supports multiple and simultaneous users |
| Data Description Language |
| Data Manipulation Language |
| Query Retrieval System for inexperienced users |

ware. The use of microcomputers by many noncomputer professionals has forced programmers to bury their sophisticated code beneath levels of simple commands and helpful screens. The world of large-scale computers is starting to be influenced by this same trend, but many years will have to pass before the mainframe data processing systems used by professionals can qualify as "user friendly." Software for mainframe systems is generally difficult to write and frequently makes demands on the knowledge, experience, and patience of its users.

*MDBS III* is a product of this mainframe environment. Even press releases for it are ponderous and technical. Consider this recent bit of promotional copy: "Both passive and active locking is supported for record types . . . and user conflicts are managed by a contention count protocol. The architecture not only supercedes older technologies, it subsumes them."

The average editor would give a press release like this about 2 milliseconds of attention. Most microcomputer users would be baffled by these sentences—and rightly so! The point to be made is that *MDBS III* is not aimed at the average editor or user. This is powerful and sophisticated software targeted for sophisticated and experienced programmers and developers. If you fit this description and have difficult database management problems to solve, or if you're simply curious, you may want to hear more about the features of *MDBS III* (see Figure 1).

## Data Relationships

Database management systems are usually classified according to the way they arrange relationships between items in the database. Different names have been attached to various data relationships. You may have heard of "hierarchical," "linear sequential," "shallow network," and other database arrangements. The current buzzwords in databases are "relational structure." While this professional terminology has filtered down to the personal computer field, keep in mind that real DBMS experts consider most database programs available for microcomputers to be little more than "file managers."

File managers are essentially sorting devices. When you use a file management program to retrieve data, it shuffles the records in its files and sorts them according to one or several specifications. Suppose you were trying to get data from the card catalog of a large library. The entire set of reference cards is arranged by author. If you wanted to find all books with a length of more than 300 pages, you would have to look at cards to set aside those representing books of the desired length. This sorting method is effective, but it takes a while to do.

Your job would be made easier if the first card you found for a book with a length of 300 pages provided you with a list of all other books with the same or greater length. You could simply use these references to effect nearly immediate results. One drawback of such a system is that the effort of updating the cards is multiplied when several types of order must be maintained. You would need an automated system that could set all pointers to show the way to the next reference.

*MDBS III* is described as a "post-relational" system. (In the esoteric terminology of database management, it could also be said to have an "extended network

***MDBS III IS sophisticated software targeted for experienced programmers and developers.***

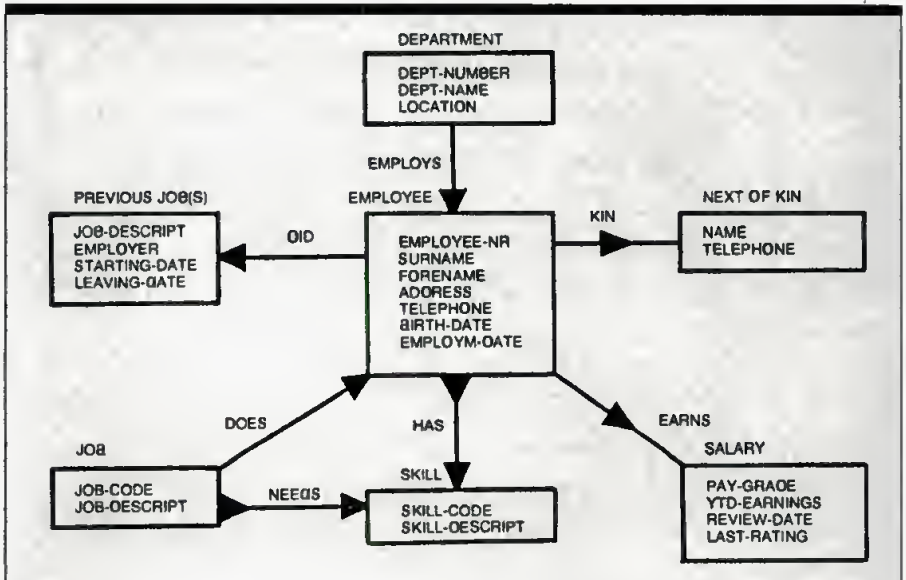



*Figure 2: This diagram of "schema" describes the relationships between the elements of data in a payroll system. MDBS III can easily handle the many-to-many relationships required by this kind of system.*



structure.") The program can treck and updeta meny different reietionships between the sets of data. The extanded natwork has the ability to usa and model relationships between date alaments much es thay are in tha rael world (saa Figure 2). A developer can almost scribble a diagram on the beck of an anvelope with circles and arrows, end put it directly into the datebasa. Ha mey improva on the modal later, but he can start building it without tha constraints and artificiel reletionships required by meny other detebase systams. If you try thinking of the circlas and arrows used in a diagram describing e football play, and at tha same tima consider the complex relationships between the players, the fiald position, the down, tha score, the tima, end meny othar factors, you'll have en idaa of how complex a deta schema could be built lnto an extendad network detabase managament system, such as *MDBS III*.

If we used one of these systems in our library axampla, tha first cetalog card you found that listed a book with ovar 300 peges would point to one or several similar cards. If you were to enter a card for a new book with over 300 pagas, a cross-referancad relationship would immediately be established between the oldar cards end the new entry. This kind of structure can be searched through very quickly; if tha software is powarful enough, it can ba updatad quickly too.

Meking availebla this kind of sophisticatad power is only the first step in tha creation of a reel databasa menegement system. System implies that many other capabilities end utilities must be part of the program packaga.

## Data Description Language

*MDBS III* has many parts. The names of thesa pieces era imposing, but their functions are aasy to undarstand. The first software module you ancounter if you creata a detabase with *MDBS III* is tha Deta Description Language. This is en actuel high ordar language (independent of others, such as BASIC), that tha databasa designer uses to describe reietionships between diffarent records in tha datebase.

The Deta Description Lenguege modula eutomatically creates a file called e "data dictionary" that stores all of tha relationships between sats of deta. The presence of this dictionary makes lt possible to change tha structure in e precticel manner. If avery saparate record had to be merked with all of its relarances, a detabase would soon be very large end changas would be difficult to maka. Tha deta dictionary ellows the program to eccess ona common point for information on how the records reieta to each other.

You heva to laarn how to use this Deta Dascription Languega just as you would learn to usa BASIC or Fortran. The language has 86 key words that are commands or dafinitions. Many of tha key words can elso be used in shorthand forms. One of tha first commands you usa in the Deta Description Language is tha one to enter the neme of tha detabase. This could ba kayed in es DATABASE NAME IS XXXXX or DB NAME IS XXXXX. Other kay words heve similar shorthand forms.

The Data Dascription Languege contains sevarei faetures designad to aid tha user, including an editor and syntax checkar. If the syntax checker cen't meke sense of en entry, it will tall you before you actuelly try and run the program. Tha editor will help you chenge an antry without axcessive retyping. The lenguege allows for free-form comments, so it's easy for progremmars to laave good notes to axplain what thay did—or at least what they tried to do.

## Features of MDBS III

When you usa the Deta Description Language, you must be awara of tha technical limits and capebilities of tha *MDBS III* package. The following are some important technical faetures of its datebase module.

1. Up to 255 different typas of records are ellowad in eech datebase. A public library might use thasa record types: biography, fiction, non-fiction, sciance fiction, etc.

2. The records can be of variable langth, but you can elso sat the program to insure thet ell records are e fixed length.

3. Each record type cen heve up to 65,535 diffarant dete itams (fields) per record type. This means that one record in e library's database could hendle enough fields for 65,535 science fiction euthors, essuming thet enough disk storege was eveilable.

4. Date items can be ASCII charecters, floating point numbers, mixed numbers and latters, binary numbers, set decimal numbers (i.e., for dollers and cents), time, and data. The progrem will check for the correct format of data as it is entered.

5. Tha data filas can be encryptad end dacrypted by a mathod that treats the usar's accass code es an encryption guida. This meens thet eech user can heve e completely private fila and that soma users can be restricted from eccessing certein perts of the detabasa.

6. As data is input, it cen be checked by tha program to insure thet it lells within a ranga specified for valid date.

7. Records can be lebelad with kays for ona-to-many, meny-to-ona, ona-to-ona, and meny-to-meny relationships.

8. Records cen be plecad into the deta-



*THE OUTPUT OF the query system can serve as input for spreadsheet and graphing programs.*

base in various types of order: last in/first out, first in/first out, next, prior, key field, and "put it where you can." The order that is used will determine how quickly certain records can be accessed and how fast updates can be mada.

9. A reference that connects a record with a data set can be craated either manually or automatically.

10. Hashing codes can be used whan entering records into the database. This method provides faster access than normal file structures.

You can't sit down and immadiately begin using the Data Description Languaga to create a database. First you'll need to study the language and learn by trial and error practicing. But your programming effort will eventually create a very detailed and powerful database structure that can answar many more of your queries, if you know how to ask tham corractly. Doing that part of the job with *MDBS III* will involve its Data Manipulation Language and Quary Retrieval System.

*MDBS III* provides two ways to gat information out of the databasa. The most traditional method is by writing a program in its Data Manipulation Language. This language module interacts with you to find out what you want to know. The other way is to usa the Query Retrieval System; this is a less formal mathod that will feel less like computer programming.

### Data Manipulation Language

Tha Data Manipulation Language is not a complete language in itself. Instead, it is addad to an existing language to give it specialized capabilities. On the IBM PC, the *MDBS III* Data Manipulation Language commands can be added to *BASIC*. A programmar could then write a program in BASIC that sets up the screen, and asks tha user questions. The program uses the answers to those quastions as instructions for extracting information from tha database. A similar program can be creatad for entaring data into the database.

The Data Manipulation Language has 13 kinds of commands. They ranga from elamantary functions that locate and retriava data from records, to Boolean logic argumants that make very complex comparisons and extractions of data. Tha host language formats output to display or print raports for review. All of the numeric and manipulative power of the host language can be used on the information extracted from the database. This means you can use *MDBS III* for accounting and statistical applications that would be difficult or impossible with most othar microcomputer-based programs that bear the name "database management system."

The commands of tha Data Manipulation Language can be used by programs written in Pascal, PL/1, COBOL, C, and assembly languaga, as wall as *BASIC*.

It has been correctly stated that aasa of laarning to usa a software package is invarsely proportional to tha number of things it can do. The *MDBS III* Data Manipulation Language provides a great deal of power and flexibility, but it is datailad and damanding to usa. It is maant for axparianced programmers.

Applications programmars who could usa this language effectively don't work cheaply. Less skillad usars will sava time and monay if they have some way to maka informal, od hoc inquiries into the database without requiring the services of a highly paid and busy programmer. Tha trand in tha mainframe database industry is to provide this kind of capability through tha usa of a quary language. A query language is a set of reasonably aasy to use commands that can pull information from a databasa without the usa of a formal program.

### Query Retrieval System

Tha quary language associated with the *MDBS III* package is callad tha Query Ratriaval System. This kind of system usually displays tha requested data on tha screen in a raw form, laaving it to the user to separata telephone numbers from social security numbers. Tha Query Retrieval System in *MDBS III* does, howaver, allow the data to be formatted into a customizad raport including labals for the data itams. The query system can report information derived from storad data by using mean, varianca and othar mathamatical functions. The output of the query system can serve as input for spreadsheet and graphing programs such as *1-2-3*, including ISE's own spreadsheet program, Knowledge Mon.

The Query Retrieval Systam is tha most friendly face of tha *MDBS III* packaga. With this system, a relativaly unsophisticated user couid writa a useful query after a few minutes of training. Twalva commands are provided in the query languaga, but tha usar (or an assisting programmar) can pre-store common inquiries that can ba performed by calling simple singla names. Small pockat guides and crib sheets posted ovar tha tarminal can be used as convaniant ramindars of tha query




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language commands.

The commands end syntex of the query lenguage ere simpla. For axampie, a query to list the names and phona numbers of all females under 35 years of age in department 43 would be writtan as LIST NAME, PHONE FOR SEX = "F", DEPT = 43 AND AGE <35 THRU DEPTS, EMPLOYEES. The query language provides e simpla kay thet unlocks tha power of a large detabese system.

### Documentation

A user who considars acquiring a peckage this complex should be concerned about documentation. For better or worse, the documentetion for *MDBS III* seems to come from tha mainframe world. Though very complete, it is written on e graduete school level, and you are presumed to have a clerk with the time to seperete the sections, entar them into tha binder, make tha paga changes, and post tha records.



*THE QUERY Retrieval System is the most friendly face in the MDBS II package.*

It took ma four dreary hours to essemble the documantation. Once I assembiad a complete set oI manuals, I Iound that they explained tha design and implementation of *MDBS III* in greet depth. The documentation set includes two excellent tutoriel books, *A Primer on DotoBose Monogement Systems*, and *A Guide to DotoBose Monogement*. Thesa, elong with the documentetion, could serve to turn a telented but inexperienced programmer into e MDBS programmer in just a few days. I would, however, beva gladly traded soma oI tha background explenations for mora samplas end examples. Iliustrated examples are a particularly good way to explein programming hints end to demonstrate efficient programming strategies.

If you don't think you will learn anough from the menuels, ISE elso offers customar support servicas and seminars. A telephone hotlina service and program updates come with the software ai no extra charge. The menufacturer's 3-day saminar on tha usa of *MDBS III* costs $500; it may be e wise investmant.

### Same Real Applications

So fer, I have described e powarful detebase menagemant peckage that requires the sarvices of a good programmer to devalop the database, can eventually be helpful to nontechnical users, inciudes many powerful features, and carries a haalthy price tag. But you might still be wondering, what can you do with it? Here are some exemplas of actual epplicetions.

● Ona organization runs ovar 60 commerciel seminars, classas, conferences, end training programs each year. More than 80 paopla attand aech event. The company needed e system able to handle both customer names and accounting informetion. Most microcomputer datebase managemant systems could handle the organization's lists of names and clesses, but the more complex paymant and corporate eccounting functions would be too much to include in the everage system.

*MDBS III* was used with a 7.5 megabyta hard disk system. The software wes used with PL/1, the host languaga, to craate a detebase witb 126 fields aggregatad into 17 record types, with 24 named relationships emong tha record types. The organization's software eventually consistad of 90 program modules for loading data and making reports from the detabese. The compeny now markets its software peckage to others in the educetion business et a price between $5,000 and $6,000, depending on the options. An investment like this can be paid back in a few months if the systam eliminetes the need for even one clarical worker.

● Another exemple comes from e small company thet developed en infor-

*MDBS III IS the most complete and flexible database management system available for microcomputers.*

mation system to be used by administrators of schools with everage enrollments of 1,000 students. Tha company estimates it spent 32 man-months devaloping the program peckage. Its software consists of 40 programs writtan in a version of BASIC, enriched by *MDBS III*. The databasa hes 15 record types, 200 fields, and 25 named relationships. The software must be used with e 5- to 10-megebyte hard disk. The company's software packages sell for between $3,500 and $4,500.

● A similer development firm used *MDBS* to davalop a medical billing package. This system took 6 man-months to develop. It Includes nine record typas, 130 fields, end nina nemed reletionships (two are one-to-one, seven are one-to-many). Tha package can serve tha offica of a doctor with 500 to 750 patients when it is run on a system with a 5-megabyte hard disk. Tha softwere and support services are sold for ebout $4,000.

### Software for Professionals

*MDBS III* is professional development software. Writing an integrated application worthy of the price and power of the packaga can take months of work. But it is by far tha most completa and flaxible detabase menagement system available for microcomputers. Reletive to tha many tens of thousands of dollers that would be charged for similar software for a mainframe computer, the mere thousands charged for *MDBS III* make it a relative micro-bargain. /PC

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*Based on Harry Browne's investment recommendations, this program provides a guide for setting up a portfolio and keeping it current.*

# Investment Planning For The Long Term

The Permonent Portfolio Anolyzer
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**Requires:** 48K, one disk drive

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Harry Browne, for those of you who have been too busy playing with your computers to keep up with the world of financial gurus, is the author of a number of books that purport to tell you how to hold on to your money as the financial world around you crumbles. Browne burst onto the scene in 1970 with his book How You Con Profit from the Coming Devoluotion. He followed this with sucb entries as How I Found Freedom in on Unfree World, You Con Profit from o Monetory Crisis, Complete Guide to Swiss Banks, New Profits from the Monetary Crisis, and Inflotion-Proofing Your Investments. He also writes an investment newsletter known as Horry Browne's Speciol Reports.

Browne really ought to do something about those schlocky titles. When I first saw them, I expected to be provided with insights on the Notionol Enquirer level ("Mad scientist discovers new formula for wealth after consultations with Jackie O.") Also, I am inherently suspicious of those who derive profit from warning others of pending gloom and doom. (My own new book, How You Con Hove Fun in the Coming Nucleor Wor, is a notable exception.)

***AN IDEALLY-designed permanent portfolio is one that provides safety and a measure of growth no matter what course the overall economy takes.***

Once I started reading the materials, however, I was surprised to learn that Browne's advice actually does make good sense. Behind the sensational titles, he really advocates nothing more than simple commonsense money management, with a few of his own eccentricities thrown in.

Specifically, Browne recommends that you set aside a proportion of your wealth in a "permanent portfolio" of investments that sbould be allowed to mature over 10 years. This permanent portfolio, once established, should be left to grow on its own, with a minimum of interim tampering, while day-to-day monetary tradings are carried on within a separate "variable portfolio." An ideally-designed permanent portfolio is one that provides safety and a measure of growth no matter what course the overall economy takes.

In his voluminous writings, Browne makes recommendations for setting up such a permanent portfolio. He has published a series of tables that correlate investment dollars measured by percentages of money available for investment to appropriate investments, depending on inflation expectations. The investor is given recommendations for setting up a portfolio based on the investor's perception of the inflationary trend, and on whether the investor wants a balanced portfolio or one

<<< THE PERMANENT PORTFOLIO ANALYZER >>> PAGE 1

CURRENT PORTFOLIO BALANCE SHEET AND EVALUATION

JOHN DOE PORTFOLIO JULY 4, 1982

| PORTFOLIO HOLDINGS (ITEM) | NUMBER OF UNITS (S) | CURRENT PRICE PER UNIT (6) | CURRENT MARKET VALUE (4) | CATEG. SHARE (3) | PURCHASE PRICE PER UNIT (4) | TOTAL PURCHASE PRICE (0) | UNREALIZED GAIN/LOSS (+) (-) | CHANGE (%) | OVER 30% CHG |
|---|---|---|---|---|---|---|---|---|---|
| 1-GOLD BULLION (OZ): | | | | | | | | | |
| BULLION ('70) | 32.15 | 305.00 | 9,806 | 1.84 | 107.50 | 6,028 | 3,778 | 62.67 | * |
| BULLION ('79) | 96.48 | 305.00 | 29,417 | 5.51 | 238.00 | 22,955 | 6,462 | 28.15 | |
| KRUGERRANDS | 50.00 | 305.00 | 15,250 | 2.86 | 369.50 | 18,475 | -3,225 | -17.46 | |
| TOTAL GOLD BULLION | | | 54,473 | 10.21 | | 47,458 | 7,015 | 14.78 | |
| 3-SILVER BULLION (OZ): | | | | | | | | | |
| BULLION | 803.75 | 5.15 | 4,139 | 0.78 | 10.00 | 8,359 | -4,220 | -50.48 | * |
| 4-SILVER COINS (BAGS): | | | | | | | | | |
| U.S. 90% | 1.00 | 5,810.00 | 5,810 | 1.09 | 10,850.00 | 10,850 | -5,040 | -46.45 | * |
| 5-SWISS FRANCS (FR): | | | | | | | | | |
| CURRENT ACCOUNT | 1,000.00 | 0.48 | 475 | 0.09 | 0.59 | 585 | -110 | -18.80 | |
| 6-SWISS FRANCS W/INT. (FR): | | | | | | | | | |
| 7% BONDS OF '83 (10) | 10,000.00 | 0.40 | 4,000 | 0.90 | 0.59 | 5,900 | -1,100 | -18.64 | |
| 5% BONDS OF '86 (10) | 10,000.00 | 0.48 | 4,800 | 0.90 | 0.54 | 5,400 | -600 | -11.11 | |
| TOTAL SWISS FRANCS W/INT. | | | 9,400 | 1.00 | | 11,300 | -1,700 | -15.00 | |
| 7-STOCKS (SH): | | | | | | | | | |
| APPLE COMPUTER | 2,000.00 | 22.00 | 00,000 | 0.25 | 18.00 | 36,000 | 0,000 | 22.22 | |
| GENERAL ELECTRIC | 1,000.00 | 63.50 | 63,500 | 11.90 | 55.25 | 55,250 | 0,250 | 14.93 | |
| LOUISIANA LAND | 800.00 | 27.75 | 22,200 | 4.16 | 36.00 | 28,800 | -6,600 | -22.92 | |
| FEDERAL EXPRESS | 600.00 | 45.50 | 27,300 | 5.12 | 49.75 | 29,850 | -2,550 | -8.54 | |
| TOTAL STOCKS | | | 157,000 | 29.43 | | 149,900 | 7,100 | 4.74 | |
| 8-LEVERAGED STOCKS (SH): | | | | | | | | | |
| GEICO WTS | 1,000.00 | 7.25 | 7,250 | 1.36 | 5.50 | 5,500 | 1,750 | 31.82 | * |
| ATLAS CORP 6TS | 1,500.00 | 5.00 | 7,500 | 1.41 | 4.50 | 6,750 | 750 | 11.11 | |
| RESORTS INT'L 6TS | 500.00 | 2.75 | 1,125 | 0.21 | 4.00 | 2,000 | -875 | -43.75 | * |
| GREYHOUND CORP 6TS | 2,000.00 | 0.75 | 1,500 | 0.28 | 1.50 | 3,000 | -1,500 | -50.00 | * |
| TOTAL LEVERAGED STOCKS | | | 17,375 | 3.26 | | 17,250 | 125 | 0.72 | |
| 10-REAL ESTATE: | | | | | | | | | |
| HOME | 1.00 | 179,000.00 | 179,000 | 33.55 | 87,500.00 | 87,500 | 91,500 | 100.57 | * |
| APARTMENT BLDG | 1.00 | 255,000.00 | 255,000 | 47.80 | 239,000.00 | 239,000 | 16,000 | 6.69 | |
| TOTAL REAL ESTATE | | | 434,000 | 81.35 | | 326,500 | 107,500 | 32.92 | * |
| 12-CASH (4): | | | | | | | | | |
| CASH | 5,000.00 | 1.00 | 5,000 | 0.94 | 1.00 | 5,000 | 0 | 0.00 | |
| 13-TREASURY BILLS: | | | | | | | | | |
| CAPITAL PRES FUND | 36,719.00 | 1.00 | 36,719 | 6.88 | 1.00 | 36,719 | 0 | 0.00 | |
| 15-TREASURY BONDS: | | | | | | | | | |
| 7 7/8% OF '02-07 | 10.00 | 610.00 | 6,100 | 1.14 | 810.00 | 8,100 | -2,000 | -24.69 | |
| 10 3/8% OF '04-09 | 10.00 | 730.00 | 7,300 | 1.37 | 860.00 | 8,600 | -1,300 | -15.12 | |
| TOTAL TREASURY BONDS | | | 13,400 | 2.51 | | 16,700 | -3,300 | -19.76 | |
| 16-OTHER L.Y.9 HOLDINGS: | | | | | | | | | |
| ATT 8 5/8% OF '07 | 6.00 | 600.00 | 3,600 | 0.67 | 875.00 | 5,250 | -1,650 | -31.43 | * |
| TWA 12 OF '05 | 6.00 | 1,030.00 | 6,180 | 1.16 | 990.00 | 5,980 | 200 | 4.00 | |
| IBM 9 1/2% OF '06 | 12.00 | 855.00 | 10,260 | 1.92 | 950.00 | 11,400 | -1,100 | -10.00 | |
| TOTAL OTHER L.T.9 HOLDINGS | | | 20,040 | 3.76 | | 22,590 | -2,550 | -11.29 | |
| 18-LONG-TERM 4 DEBTS: | | | | | | | | | |
| HOME MORTGAGE | 1.00 | -69,000.00 | -69,000 | -13.00 | -39,350.00 | -39,350 | -50,450 | 77.38 | * |
| APT BLDG MORTGAGE | 1.00 | -154,750.00 | -154,750 | -29.01 | -179,900.00 | -179,900 | 25,150 | -13.98 | |
| TOTAL LONG-TERM 6 DEBTS | | | -224,550 | -42.09 | | -219,250 | -5,300 | 2.42 | |
| GRAND TOTALS | | | 4533,401 | 100.001 | | 8433,961 | 499,520 | 22.93% | |

*Figure 1: A printout of the bolance sheet and evaluation using the somple portfolio provided with the program disk.*

in which he "goes for broka" (betting the ranch that tha inflationary scenario he predicts will in fact take place). In the balanced approach, which Browne mandates for anyone investing substantial funds, the investor's assats will be protected no matter what coursa inflation takes (although he will of course do better if be guesses right on the direction of inflation). In the go-for-broke approach, the investor will do extremely well if he guesses right on the inflationary direction but could be wiped out if he guesses wrong.

## Enter The PC

What has all this got to do with my IBM Personal Computer? Just this: Figuring out how to construct your portfolio, and then predicting its future performance, requires frequent reference to the tables Browna providas for his readers and subscribers. Alterations in assumptions, or changes in the portfolio, demand time-consuming recomputations. The ideal tool for making mundane and repetitive computations quickly and accurately is the computer!

C. R. Hunter & Associates came to the sama conclusion, and now offars *The Permonent Portfolio Anolyzer*, which allows Harry Browne's davotees to construct their permanent portfolios based on examlnation of different outcomes and assumptions. With this program, you can examine more options in an evening than you could otherwise review in a month using blunted pencils and overworked calculators. Consequently, you can basa your investment decisions on a greater wealth of simulated experiance.

***APPENDED TO the manual are some excerpts from the writings of Harry Browne that explain his permanent portfolio philosophy.***

This program is, in effect, a dedicated spreadsheet. It inputs your lnformation about expendable funds and existlng

investments and makes recommendations as to how to construct a portfolio, prints a balance sheet of your existing portfolio, prints a 10-year projection of your portfolio vs. the recommanded portfolio, and advises you of what changes must be made (purchases or sales) to bring your portfolio into line with the recommended portfolio. Because of the program's ability to instantly recalculate figures, it is ideal

***THERE ARE ten options on the main menu of the program and each of these in turn is explained by the operations manual.***

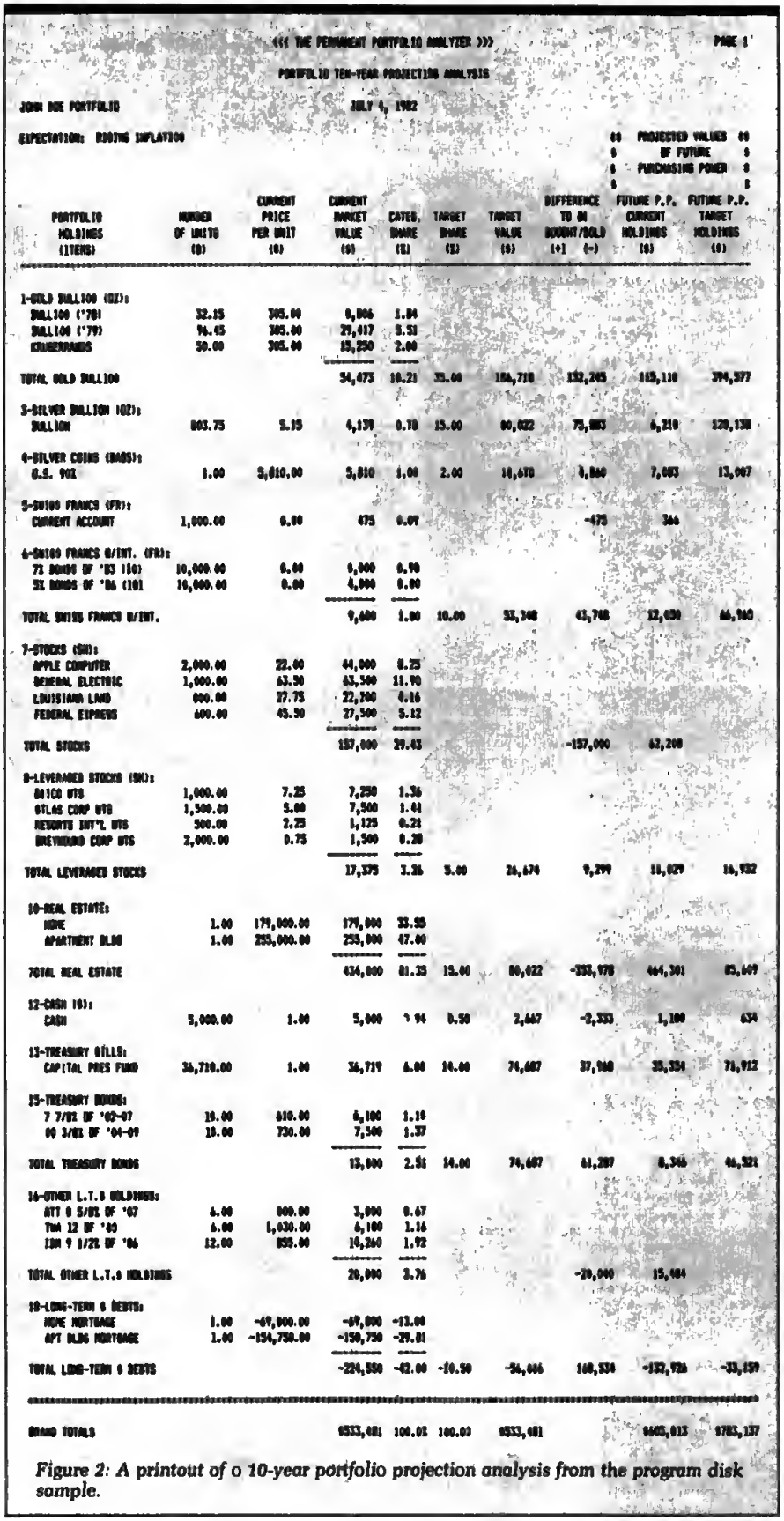
for doing "what if" analysis.

For what it does, The Permonent Portfolio Anolyzer is good. If you are a devotee of Harry Browne and heva an IBM Personal Computer, you should really love this program. Even if you are not a Harry Browne fanatic, the program permits you to alter Browne's assumptions about anticipated performance of diffarent categories of investments. If nothing else, it will get you to think about how your money is being investad, a sound goal for anyona living above subsistence level.

## Inside The Program

The Permonent Portfolio Anolyzer comes with a wall-writtan operations menuel that thoroughly expleins how to enter data. Appended to the manual are some excerpts from the writings of Harry Browna that explein his permanent portfolio philosophy and the assumptions upon which his tables (which are already built into the program) are based. Actually, these excerpts ere es much of Browne's writing as you will ever need to read in order to fully understand tha program's underlying theory and to use it as a tool for defining your invastment strategy.

Commendably, the documentation is writtan specifically for the IBM Personal Computer, although an earlier version was tailored to tha Apple Computer. Consequently, The Permonent Portfolio Ano-



«« THE PERMANENT PORTFOLIO ANALYZER »»  PAGE 1

PORTFOLIO TEN-YEAR PROJECTION ANALYSIS

JOHN DOE PORTFOLIO  JULY 4, 1982

EXPECTATION: RISING INFLATION

| PORTFOLIO HOLDINGS (ITEMS) | NUMBER OF UNITS ($) | CURRENT PRICE PER UNIT ($) | CURRENT MARKET VALUE ($) | CATEG. SHARE (%) | TARGET SHARE (%) | TARGET VALUE ($) | DIFFERENCE TO BE BOUGHT/SOLD (+) (-) | PROJECTED VALUES OF FUTURE PURCHASING POWER FUTURE P.P. CURRENT HOLDINGS ($) | FUTURE P.P. TARGET HOLDINGS ($) |
|---|---|---|---|---|---|---|---|---|---|
| 1-GOLD BULLION (OZ): | | | | | | | | | |
| BULLION ('78) | 32.15 | 305.00 | 9,806 | 1.04 | | | | | |
| BULLION ('79) | 96.45 | 305.00 | 29,417 | 3.11 | | | | | |
| KRUGERRANDS | 50.00 | 305.00 | 15,250 | 2.00 | | | | | |
| TOTAL GOLD BULLION | | | 54,473 | 10.21 | 35.00 | 186,718 | 132,245 | 165,110 | 394,377 |
| 3-SILVER BULLION (OZ): | | | | | | | | | |
| BULLION | 803.75 | 5.15 | 4,139 | 0.78 | 15.00 | 80,022 | 75,883 | 6,210 | 120,138 |
| 4-SILVER COINS (BAGS): | | | | | | | | | |
| U.S. 90% | 1.00 | 5,810.00 | 5,810 | 1.09 | 2.00 | 10,670 | 4,860 | 7,003 | 13,007 |
| 5-SWISS FRANCS (FR): | | | | | | | | | |
| CURRENT ACCOUNT | 1,000.00 | 0.00 | 475 | 0.09 | | | -475 | 344 | |
| 6-SWISS FRANCS B/INT. (FR): | | | | | | | | | |
| 7% BONDS OF '83 (10) | 10,000.00 | 0.00 | 0,000 | 0.90 | | | | | |
| 5% BONDS OF '86 (10) | 10,000.00 | 0.00 | 4,000 | 0.00 | | | | | |
| TOTAL SWISS FRANCS B/INT. | | | 9,600 | 1.00 | 10.00 | 53,348 | 43,748 | 12,030 | 66,960 |
| 7-STOCKS ($U): | | | | | | | | | |
| APPLE COMPUTER | 2,000.00 | 22.00 | 44,000 | 8.25 | | | | | |
| GENERAL ELECTRIC | 1,000.00 | 63.50 | 63,500 | 11.90 | | | | | |
| LOUISIANA LAND | 800.00 | 27.75 | 22,200 | 4.16 | | | | | |
| FEDERAL EXPRESS | 600.00 | 45.50 | 27,300 | 5.12 | | | | | |
| TOTAL STOCKS | | | 157,000 | 29.43 | | | -157,000 | 42,200 | |
| 8-LEVERAGED STOCKS ($U): | | | | | | | | | |
| BASIC BTS | 1,000.00 | 7.25 | 7,250 | 1.36 | | | | | |
| ATLAS CORP BTS | 1,500.00 | 5.00 | 7,500 | 1.41 | | | | | |
| RESORTS INT'L BTS | 500.00 | 2.25 | 1,125 | 0.21 | | | | | |
| BREWSKRO CORP BTS | 2,000.00 | 0.75 | 1,500 | 0.28 | | | | | |
| TOTAL LEVERAGED STOCKS | | | 17,375 | 3.26 | 5.00 | 26,674 | 9,299 | 11,029 | 16,932 |
| 10-REAL ESTATE: | | | | | | | | | |
| HOME | 1.00 | 179,000.00 | 179,000 | 33.55 | | | | | |
| APARTMENT BLDG | 1.00 | 255,000.00 | 255,000 | 47.80 | | | | | |
| TOTAL REAL ESTATE | | | 434,000 | 81.35 | 15.00 | 80,022 | -353,978 | 464,301 | 85,609 |
| 12-CASH (C): | | | | | | | | | |
| CASH | 5,000.00 | 1.00 | 5,000 | 0.94 | 0.50 | 2,667 | -2,333 | 1,100 | 634 |
| 13-TREASURY BILLS: | | | | | | | | | |
| CAPITAL PRES FUND | 36,710.00 | 1.00 | 36,719 | 6.88 | 14.00 | 74,687 | 37,968 | 33,354 | 79,912 |
| 15-TREASURY BONDS: | | | | | | | | | |
| 7 7/8% OF '02-07 | 10.00 | 610.00 | 6,100 | 1.15 | | | | | |
| 00 3/8% OF '04-09 | 10.00 | 730.00 | 7,300 | 1.37 | | | | | |
| TOTAL TREASURY BONDS | | | 13,000 | 2.51 | 14.00 | 74,687 | 61,287 | 8,346 | 46,321 |
| 16-OTHER L.T.G OBLIGNS: | | | | | | | | | |
| ATT 8 5/8% OF '07 | 6.00 | 000.00 | 3,000 | 0.67 | | | | | |
| TVA 12 OF '03 | 6.00 | 1,030.00 | 6,100 | 1.16 | | | | | |
| IBM 9 1/2% OF '06 | 12.00 | 855.00 | 10,260 | 1.92 | | | | | |
| TOTAL OTHER L.T.G HOLDINGS | | | 20,000 | 3.76 | | | -20,000 | 15,484 | |
| 18-LONG-TERM G DEBTS: | | | | | | | | | |
| HOME MORTGAGE | 1.00 | -69,000.00 | -69,000 | -13.00 | | | | | |
| APT BLDG MORTGAGE | 1.00 | -154,750.00 | -150,750 | -29.81 | | | | | |
| TOTAL LONG-TERM G DEBTS | | | -224,550 | -42.00 | -10.50 | -36,006 | 188,534 | -132,926 | -33,139 |
| GRAND TOTALS | | | 9533,681 | 100.01 | 100.00 | 9533,681 | | 8605,013 | 9783,137 |

*Figure 2: A printout of o 10-year portfolio projection analysis from the program disk sample.*

lyzer evoids the shortcomings of so meny programs on the market thet provide nothing more than a cover sheet to summarize the IBM features and confusing references to incompetible machine requirements in the remainder of the documentation. Pictures are provided of specific IBM PC keys required by the program.

There are ten options on the main menu of the progrem end eech of these in turn is expleined by the operetions menuel. The first option is to enter your current portfolio. There ere 19 different types of investments, including "other." Prompts for existing investments in each cetagory are given in sequence. After entering each item, you are permitted to edit eny errors; aftar the item is correct you can enter it end proceed to the next entry. After you enter your investments, you are prompted to give the portfolio e neme for storege on disk. The neme is limited to eight charecters to conform to DOS file-naming conventions. (Portfolio entries are stored on disk with e .P extension.)

Option 2 provides recommendetions as to whet emounts to commit for verious types of investments. These recommendetions are based on the amount of money available to invest, on which inflation scenario you parceive as most likely (from e choice of five with an additional "uncertain" category), and on whether you desira e belanced (hedged) portfolio or prefer to go for broke, betting all your marbles thet you are guessing right on the direction infletion will teke. After you have entered the emount of money to invest, the anticipeted inflation scenario, and desired risk level, the program responds with its recommended investments by category, indicating both the percentage of the totel investment and the dollar amount to be invested in eech category.

*OPTION 4 shows what changes are necessary to bring the actual portfolio into compliance with the recommended portfolio.*

Option 3 prints out a balance sheet for your current portfolio that breaks down the performance to dete of the items in the portfolio. This is used to periodically check and updete the progress of your investments. Before the edvent of the computer age, such updates were time-consuming; consequently, investors rerely received en updete more than once e year. With the computer, this eid can be used more frequently to track the velue of your portfolio. Figure 1 shows the output of the balance-sheet eveluation, using the sample portfolio provided with the program disk. The balance sheet computes the total worth of tha entire portfoiio, as wail as the worth of eech of the component investments. It then contrests the percentege of the total represented by eech component investment egainst eech component cetegory. It shows how well (or poorly) eech investment has done end highlights (with an asterisk in the extreme right-hand col-


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umn) those that have appreciatad or depreciated more than 30 percent since the original purchasa.

Option 4 prints out a projection of how your portfolio will do over a 10-year period, compared with the anticipated performance of a racommanded portfolio. Additionally, Option 4 shows what changes are necessary to bring the actual portfolio into compliance with the recommended portfolio. It computes the estimated future purchasing power of both the existing and recommended portfolios expressed in today's dollars. Again this is made possible by the speed of the computer, as it would be inordinately time-consuming to do all of the discounting nacessary to produce current dollar figures using a manual approach, particularly if you wantad to alter tha yearly inflation figures. Figure 2 provides a sample of the output of Option 4, again using the sample portfolio set forth on the program disk.

Option 5 allows you to change entries in your portfolio, add new entries (for new purchases), or delete existing entries (when investments are liquidated). This editing option permits you to maka changes in the existing portfolio without having to re-enter the entire portfolio. (As with any program requiring data retention, it is a good idea to maka backup copies and to change and test the backup before tampering with the original; to its credit, the manual stresses this point.)

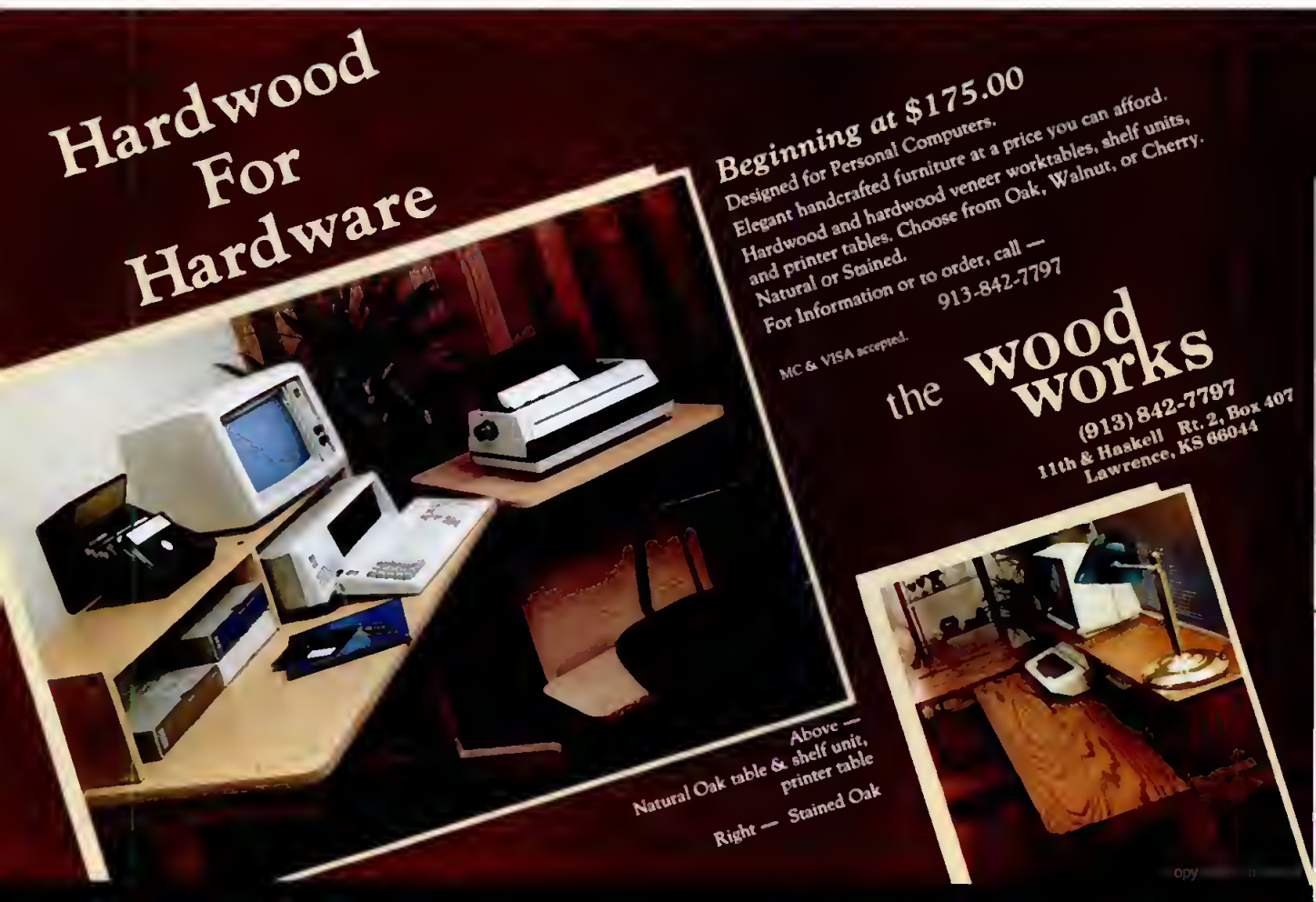
Option 6 permits you to change Harry Browne's assumptions about inflation rates and the future performance of various categories of assets. This option lends *The Permonent Portfolio Anolyzer* its power because it makes the program a useful tool even if you totally disagree with Harry Browne's assumptions.

*OPTION 6 makes the program a useful tool even if you totally disagree with Harry Browne's assumptions.*

Options 7 through 10 perform housekeeping operations to anhance ease of use. Option 7 permits you to delete a stored portfolio, thus clearing disk space for data entry. Option 8 causes a temporary exit to DOS and permits a check of the disk, showing how mucb space is left on the disk for new data entry. With Option 9, you may customize *The Permanent Portfolio Anolyzer* to your printer by telling tha program whether or not to use condensad print, how many linas par page, and even to send ASCII escape sequences to tha printar. Option 10 provides an exit from the program to BASIC but not before prompting with a friendly reminder about disk backup.

### Bottom Line Bugs

While the program performs well for those interested in its basic purpose, there are a few shortcomings and program bugs. The worst outright bug on the copy of the program provided for review was that on

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the balance sheet end projection printouts, it persisted in printing the first category (gold bullion) above the title entries for the pege. I essume that this bug will be speedily corrected.

***WHILE THE program performs well for those interested in its basic purpose, there are a few shortcomings and program bugs.***

More fundamentel and difficult to correct are some of the limitations built into the data entry functions of the program. All items ere entered eccording to type of item, number of units, purchase price per unit, and current price per unit. While this is fine for some cetegories, it is e little syntectically awkwerd for others. For example, the program confines you to the category "purchese price" when the category is "cesh," and "number of units" when the item is a house. A bit more customization of the prompts in individual categories would be helpful.

Also, true to its secret identity as a spreadsheet, the program simply performs numerical computations without regard to how silly the numbers might be in the real world. For instance, if you are using Option 2 of the program to receive recommendetions for creating an ideal portfolio and you tell the program that you have $500 to invest, the program does not modify its recommendations (or perhaps even tell you thet you can't get much diversity from a $500 investment), but dutifully applies its multipliers and edvises you to put 20 percent into real estete, which it handily computes to be $100. Those of us with nondigitel menteilities intuitively recognize that the number of $100 real estate investments in today's world is painfully limited.

The biggest shortcoming of e program such as this, however, is one which has nothing to do with the wey in which the program itself is written, but relates instead to the perceptions of the user. Because of the ability of the computer to spew out mounteins of numerically-accurate computations, it becomes ell too easy for the user to lose sight of the guesswork and speculetion thet form the foundetion for the numbers.

For those looking for e computerized crystal ball, neither this program nor any other will suffice. Simply because the progrem prints out a figure purporting to represent future purchasing power of a given investment, computed down to the penny, does not mean that this projection will meterialize. Economics is et best an imprecise science; economic forecasting over the long haul is roughly on a par with long-term weather forecasting. Asking the ten leeding economists for their predictions will certainly produce et least ten different responses.

Bearing this in mind, the user who thinks that this or eny other program can guarantee future prosperity is bound to be disappointed. On the other hand, commonsense money management can and does pey off. To the extent thet the user recognizes a need for intelligent planning end requires e tool to provide a fremework for such planning, *The Permonent Portfolio Anolyzer* can justify its cost many times over. */PC*


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Many of you probably use e number of programs on your IBM Personel Computers. A typicel list of tha most commonly-used programs would include a word processor, a spreadsheet program, a datsbase manager, and e communications package. If you own the IBM graphics adapter, the list might also include e program for creating graphics. The problam with this epproech to epplications is that the programs don't necassarily relate to ona another. Moving information from one program to another can be difficult.

With the advent of the PC, end other microcomputers with larga memory capacity, e new breed of programs, known as "integrated managemant" systams began to eppear. These combine the most common epplications into one program. The first of this new breed was Context *MBA* from Context Management Systems of Torrance, California.

***CONTEXT STILL runs too slowly for a person accustomed to the speed of a microcomputer.***

A simple example illustrates the concept of integrated software. Suppose you need to produce a report containing next year's divisional sales forecasts. The first step is to retrieva the division's historical sales information from the corporate databasa. Naxt, you insert this informetion into the spreedsheet to obtain next year's forecast. If possible, you convert tha results into a plot showing the divisional growth curve. Perhaps you compare e few scenarios on the same plot. Using the word processor, you would generete the report, and insert the plots and partinant figures. Finally, you would hook the computar to a modam and sand the report to the managers vie electronic meil.

With the usual unreleted software programs, this procedure would probably be long and tedious. By using Context *MBA*, howaver, you could do tha job in wall under an hour. It therefore must be acknowledged that Context *MBA* is not perfect; in fact, tha program can be clumsy and troublasome. Daspite the PC's 8088 processor, Context still runs too slowly for a person accustomad to tha speed of a microcomputer. Nevertheless, its ebility

to transform a spreadsheet into a graph and a report, and creata a naw graph and a new report within minutes based on different assumptions is exciting.

### Hardware Requirements

Context *MBA* requires at least 256K RAM and et least two disk drives. With additional memory, execution speed or workspaca size can be increased. To produce graphics, an IBM color graphics adaptar and a monitor ara also required. A printer is required for printed output. Context *MBA* Varsion 2.0 supports only tha Hayes modems or dumb acoustic modems for data communications.

*CONTEXT features modules for a database, spreadsheet, word processor, and communications.*

The program is written in UCSD Pascal and is heavily copy-protected. This implies thet it cannot be used with either e RAM disk or a hard disk at this time. Furthermore, files created by Context cannot be used by any MS-DOS programs.

Context can support a worksheet containing up to 999 rows and 95 columns. Database operations can elso support 6,000 rows.

### Software Overview

Context features modulas for a database, spreadsheet, word processor, and communications. In Context Version 1.4, thasa are refarred to separataly as "contexts." They function little better than four programs with easy data exchange between them. In Version 2.0, howaver, the modules act es additional spreadsheat commands, a significant improvamant.

Whan a number of applications ara camanted into a single program, quelity is somatimes sacrificed. In the case of Context *MBA*, nona of the modulas, except tha spreadsheet, is as varsatila as a corresponding high quality MS-DOS program. The mamory requirement is also greater than for four saparata programs.

### Creating Documents

Before you can begin to create a document, Context must format e biank data disk. This disk can be givan a "Volume" neme and a "Folder" subheading. Each worksheet, called a "Document," can also be givan a nama. By providing more catagories, this allows greater flexibility than 11-character file names. In addition, documents in diffarent foldars can hava tha same names without conflict.

### The Spreadsheet

The spraadsheet is undoubtedly tha most useful modula in Context *MBA*. It parforms all standard spreadsheet functions, such as placing formulas, numbers, and labels in cells and then formatting them. Cells may also contain text (each cell has an 8,000 charactar limit) and graphs. You can replicate, delete, and move this information in the same wey as in a standard spreadsheat.

Tha array of call formatting commands is impressiva. Cells may be in dollar or percent format and can be right, left, or center justified. Cells can be displayad in fixed, scientific, or engineering format, and display precision may be fixed, with rounding or truncation. In addition, a row can actuelly be displayad as a number of rows on tha screan, sinca cells may contain lines of text or graphs. Similarly, a column can have any width, and mey even take up the entire screen.

### Context Vs. VisiCalc

Tha spreadsheet bears a more than superficial resamblanca to *VisiCalc*. Context, however, improves on *VisiCalc* in a number of ways, notably, by providing bettar halp massagas, variable column and row sizes, and graphics capabilities.

Although Context reteins *VisiCalc*'s commend structure, its additionai capabilitias maka the command strings confusing. For axampla, supposa you wish to replicata fiva columns from row *A* to row *B*, copying tha contants of aach call into a new row. With *VisiCalc*, this commend is /R(A1...A5)<cr>Y. With Context, it becomas /R(A1...A5<cr>CB1<cr>1<cr>Y (whare <cr> maans "Press tha Enter kay"). Admittedly, Context is more versatile; this same command can also be used to replace a table and to make a number of copies of the table. It's questionable, however, whether the gain in versatility compensates for difficulty in remembering the command syntax and the increased, time-consuming disk activity.

### Split Screens

Lika *VisiCalc*, Context *MBA* features a window capability. Tha screen can be split aithar horizontally or vartically to dlsplay up to four separate windows simultaneously. This is particularly useful when a taxt cell is axpandad to fill tha antire window. By synchronizing the windows, you can display part of a databasa, along with a half-paga textual dascriptlon of tha top row of data. In the sama way, a spreadsheet can be displayad alongside a graphic rendition of its data.

### Graphs

Context allows you to choosa from an extansiva array of graphs, including bar, lina, pia, scatter, high-low-close, area, stacked bar, and side-by-side bar graphs. By microcomputer terms, thesa graphs taka a fair amount of tima to ganerate—about 1 minuta, but tha results are pleasing and probably wall worth the affort.

To creata graphic displays, as well as to print, you must hava an IBM graphics adapter .A color monitor is not necessary, howavar, and the printad result contains diffarent shading pattarns.

A graph is specifiad in tha sama way as a printer or a communications lina. For axampla, a call containing tha formula @PLOT(BARS)+@DATA(R,B2...E6)+@TTL(R,'My plot') would specify a stacked bar graph with tha data selectad by rows for rows B through E, eech row containing columns 2 through 6. A title would be included to the right sida of "My Plot."

*IN VERSION 2.0, the modules act as additional spreadsheet commands.*

A plot is displayad only when tha cell is axpanded to fill a window; otharwise, the cell displays "GRF."

### Database Manager

A database, as defined by Context *MBA*, is a tabular worksheet with a row of




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titles along the top. A general worksheet cannot reelly be used as e database; instead, the contents of each cell are a label or a value. A subset of the current worksheat cen be used as a datebase.

Once you gain access to e detabase via the command /SAA, you can specify search criteria by placing the desired values in cells. Here is an example:

| First neme | Last name | Address | Phone |
|---|---|---|---|
| Mark | Z... | | ...MD |

These entries wilt select people living in Marylend whose lest names begin with e Z, and whose first names ere Mark.

The selection process can ectuelly insert the desired records into the current worksheet rows. In fact, database operations can be performed on a competibla standard worksheet. Unfortunately, in order to select records from a database on disk, the rows on the worksheet must be set up in the same format as those in the database. This can be confusing.

Context includes a number of detabase-like commands that cen be used to manipulate rows. Rows can be sorted in escending or descending order. As with selection, the sort criteria are entered into the worksheet cells and then the sort is requested. Duplicates may be removed.

As in the example ebove, the selected valuas can be plottad, totaled, used in forecasts, pleced into e text cell, sent over the communications line, replaced and/or appended to the datebese.

***DATABASE operations can be performed on a compatible standard worksheet.***

Detebese selection is very slow; e single search criterion on a databasa of 114 records takes 4:44 minutes to complete. Surprisingly, the demo documentetion telks about using this method to look up phone numbers (which I did) with a database of 6,000 records. At this speed, the oparetion would taka ebout 4 hours! Evan with 200 records, the whola oparetion would take 10 minutes, including load time—not very convenient.

### Communications

The communicetions fecility of Context is e bit crude, elthough the program does include a number of useful commands that make eutometing the communication task simple.

Communications operetions are parformed in the same way as plotting functions, by filling e cell (or several cells) with the communications formulas. For example, the formula @DIAL('555-1212',T)+@RECEIVE('>')+&SEND{B1} will touchtone dial the number 555-1212, wait for a > sign, then send the contents of cell B1. There is also e provision for using acoustic modams or Hayes modems. If you do not specify tha modem, Context


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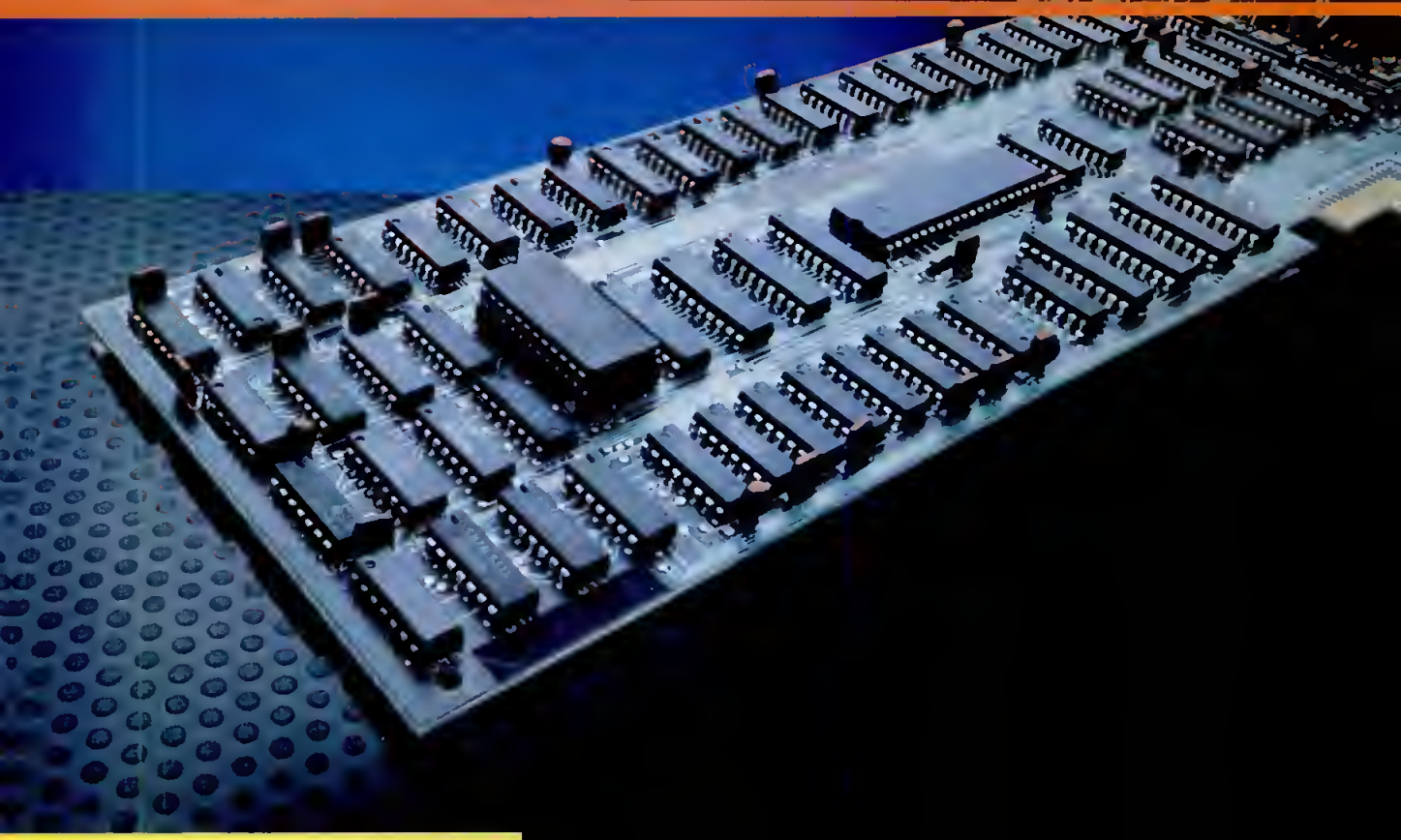
Create Key File
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requires a Dial command in order to enter communications mode.

Communications is a true mode. (A mode is a piece of a program in which certain commands may not perform the same functions as in other pieces of the program.) This means that you must exit from the mode to perform functions other than simple communications functions. You can keep the characters that you've received, but any characters received while performing other operations are lost. After you exit from the mode, you can transmit a cell, return to communications mode, or switch to a new cell. Since each cell holds only a maximum of 8,000 characters, you must remember to move to a new cell occasionally if you want to keep the communications information.

*THE TEXT EDITOR also includes search and replace commands that operate on only one word at a time.*

I encountered a swarm of bugs in the communications mode. For instance, Context did not come up in half duplex, despite my request. Tabs are not displayed. Error messages are pitifully brief. Text is not always saved. In addition, 1200 baud does not work well; the screen does not scroll, but instead, works in a circular page mode. Obviously, the program will not run at speeds faster then 1200 baud without dropping characters.

In general, command options are confusing, and operation is not very smooth. If your primary purpose is to send and receive other *MBA* spreadsheets, however, the communications mode is adequate. You can send the first 8,000 characters, move to a new cell, and receive some more characters. For spreadsheets with fewer than 8,000 characters, the entire process can be automated, from dialing to hanging up the phone.

Once a cell is filled with a worksheet of information, the information can be expanded into a set of cells, then manipulated just like any other worksheet.

## Text Editing

The earlier versions of Context had an amazingly incomprehensible and unusable text editor. Version 2.0 is somewhat better, but it is still very clumsy, compared to almost any MS-DOS editor.

Every function in the editor is performed in modes. To delete a character, you must enter delete mode, space over the offending characters, then exit from delete mode. Hitting a return deletes a full line, although this is not apparent until you complete the function.

To insert characters, you must enter insert mode (at which point all successive lines disappear from the sheet), type in the new characters, then exit from insert mode. Finally, in order to save the text, you must remember to type ^C in all the right places. The formula editor works in the same way, making it extremely difficult to edit a formula.

## Search and Replace

The text editor also includes search and replace commands that operate on only one word at a time. A Marginate command fills and justifies paragraphs. Blocks are moved by using the savespace com-


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mand, which can also be used to insert graphs or cells into the text.

Since Context runs under UCSD p-System, and because of its folder and document setup, it is not possible to use an MS-DOS editor first and then put the document into Context. Because the editor performs so poorly, this is a serious defect.

*CONTEXT requires a hefty 256K, every operation requires some disk activity, and the program is extremely slow.*

### Taking Everything Together

It is impossibla to list all of the options and commands within the Context *MBA* program in a review of this size. Tha best overall summary would be that the designers included neerly all of the desirable options for a spreadsheet. The grephics displays are also very usable and versatile, but the need for a grephics adapter is discouraging. Tha databasa managar is amazingly slow, easy to use, but not as versatile as the better database managars on the market. The communications mode is confusing and not nearly as good es most smart terminal programs. It does excell in autometed transmission/reception of portions of tha worksheet. Tha text editing is clumsy and confusing, better than nothing, but not nearly as effective as the better MS-DOS editors.

### Major Defects

*Context MBA* faiis in two major areas. The first is implementation. Despite protests to the contrary, UCSD p-System simply doas not produce good code. Context requires a hefty 256K, avery operation requires some disk ectivity, and the program is extremaly slow. For example, just loading Context takes 2½ minutes. The amount of disk reading, writing, and searching involved in this program makes me wonder whether or not Context reduces the lifetime of drives, aspecially whan it is compared with programs that can run under a RAM disk (for no disk activity) or e hard disk. On tha basis of speed alone, I think it would be difficult to convince anyone who has used a microcomputer before to seriously consider Context, unless the application requiras a feature that only Context can provide.

Tha second area in which Context fails is design. The Lisa and tha Xarox Star seem particularly appealing because thay feature modalass software. Context, on the other hand, is chock full of modes. This makes it easy to forget which mode you are in, causing the program to do something unexpected. In addition, error messages are terribly short (sometimes just e beep), making matters even worse. (I must admit, however, that Version 2.0 is much better than 1.4 in this respect. Ironically, the difference is thet Context *MBA* Version 2.0 no longer has contexts.)

The idea of an integrated management system is excellent. Context *MBA* does succeed in this area. It is very aesy to transfer information from one program to anothar. Navarthalass, a good sat of compatible taxt aditing, database, graphics, and spreadsheet programs that runs under MS-DOS is probably a better investment.

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| 3468 | | x | x |
| 3903 | | x | |
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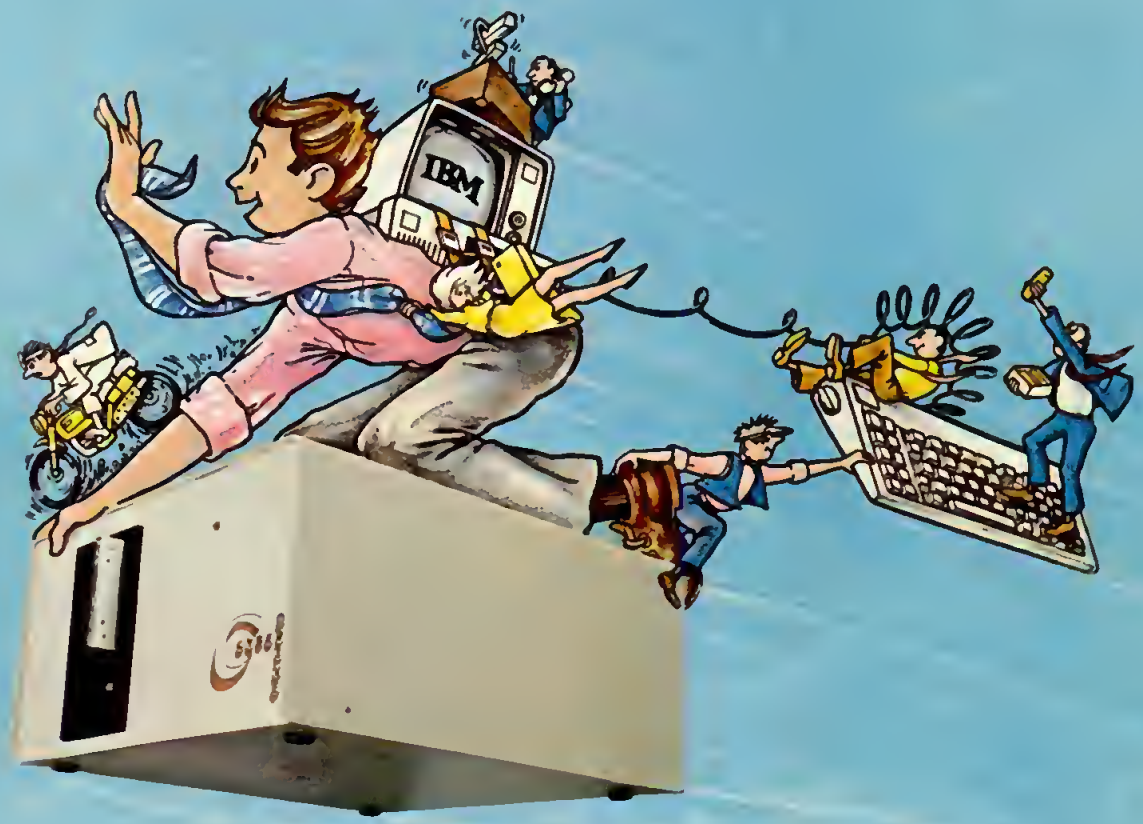

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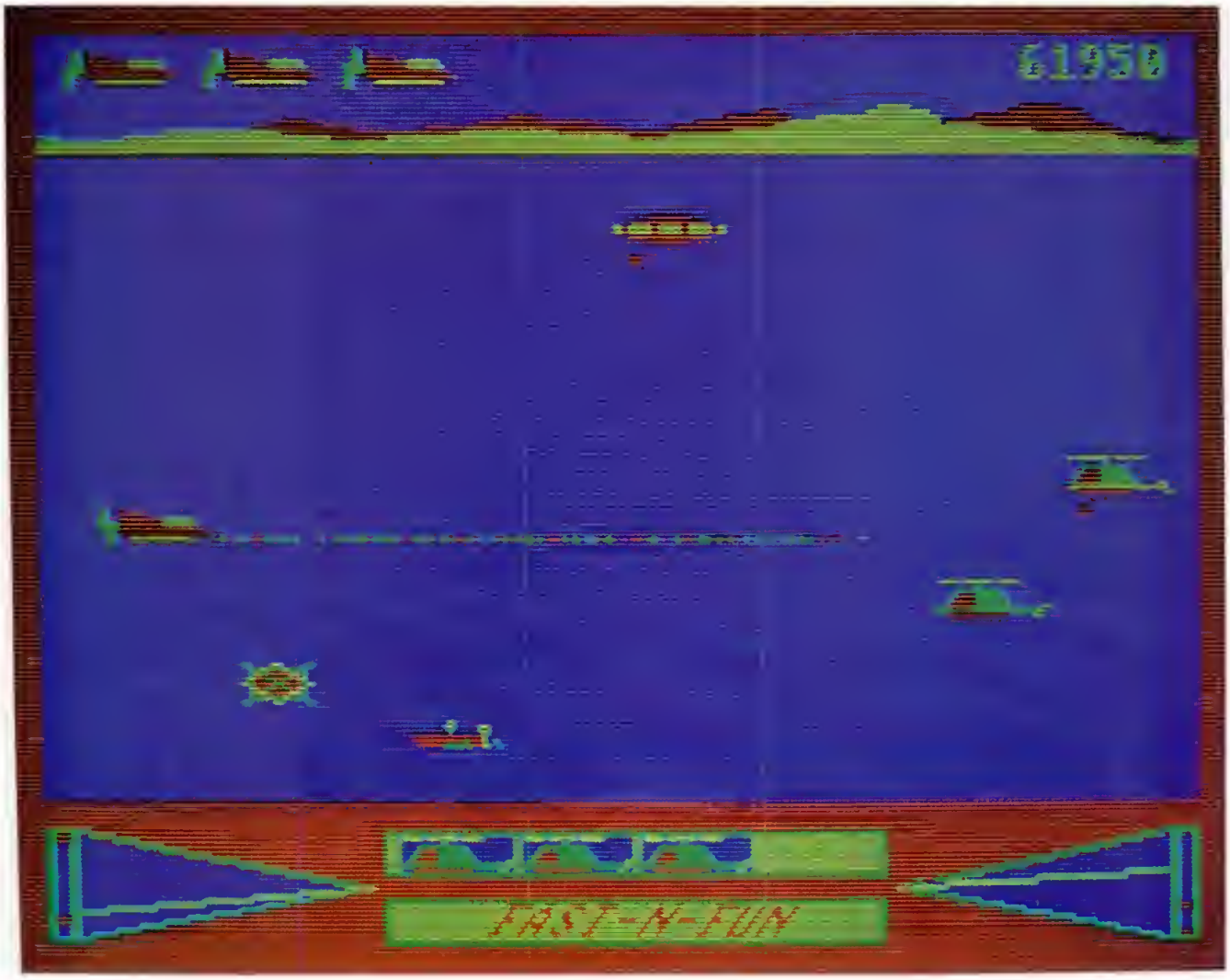
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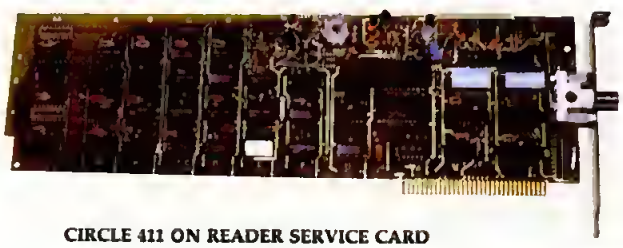
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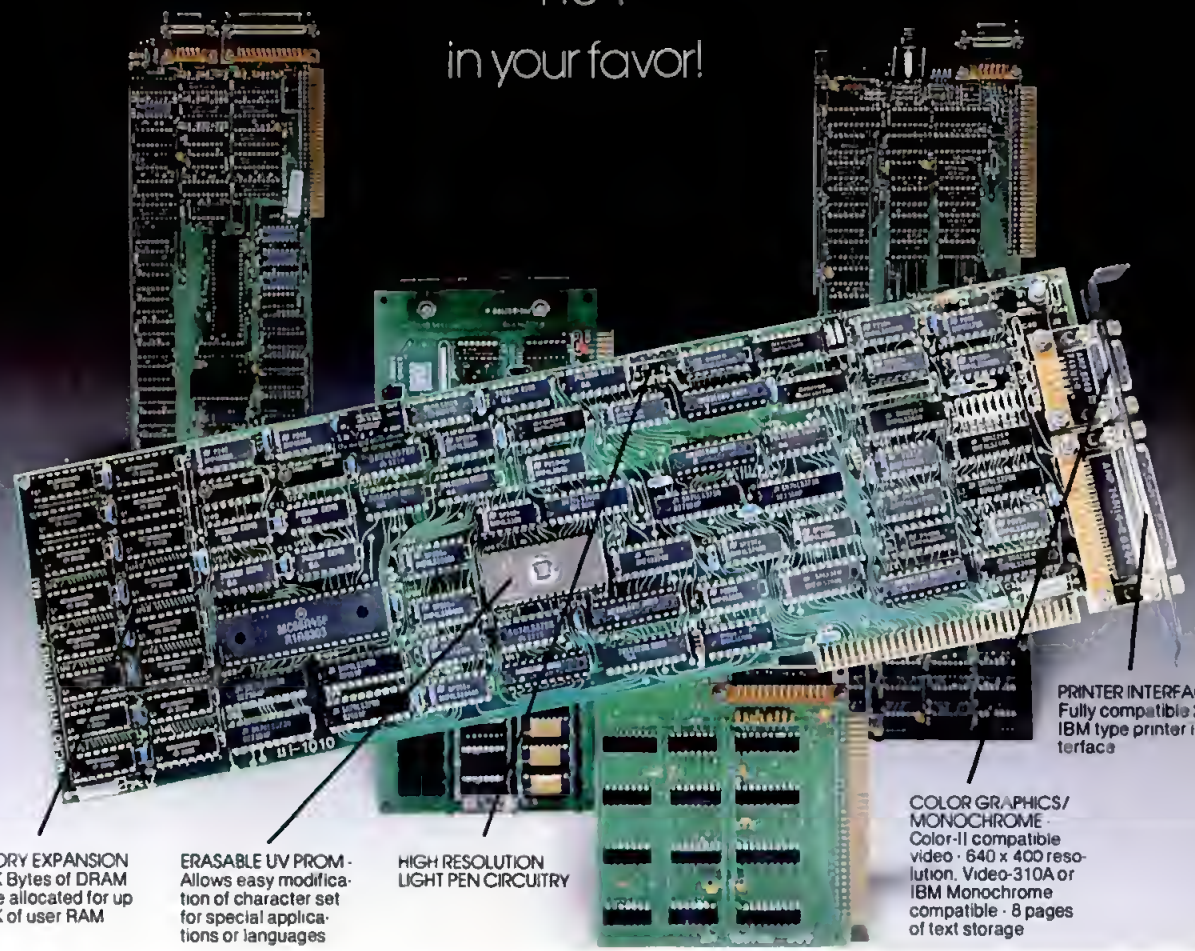
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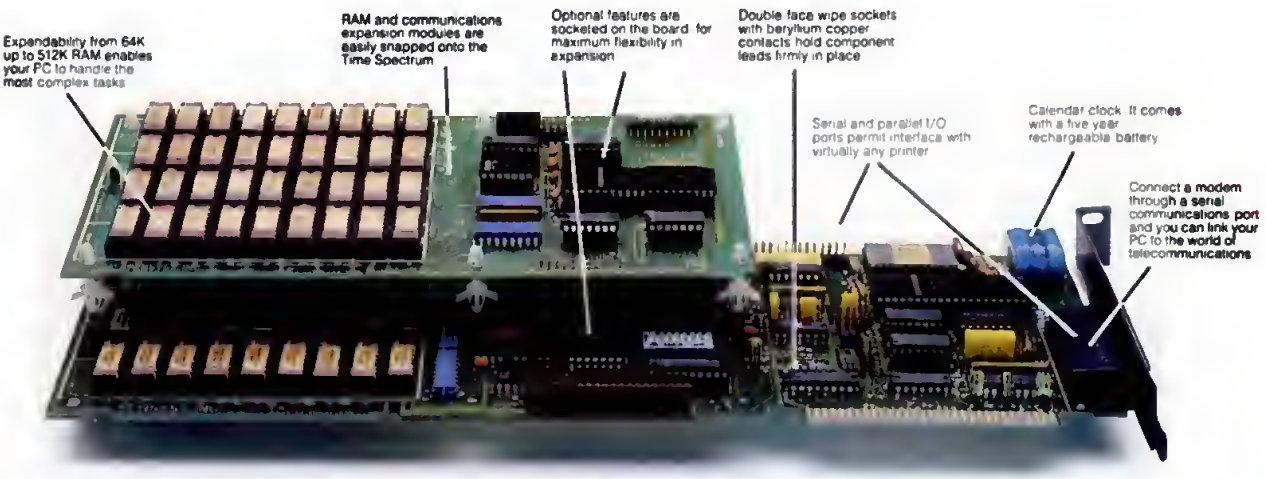
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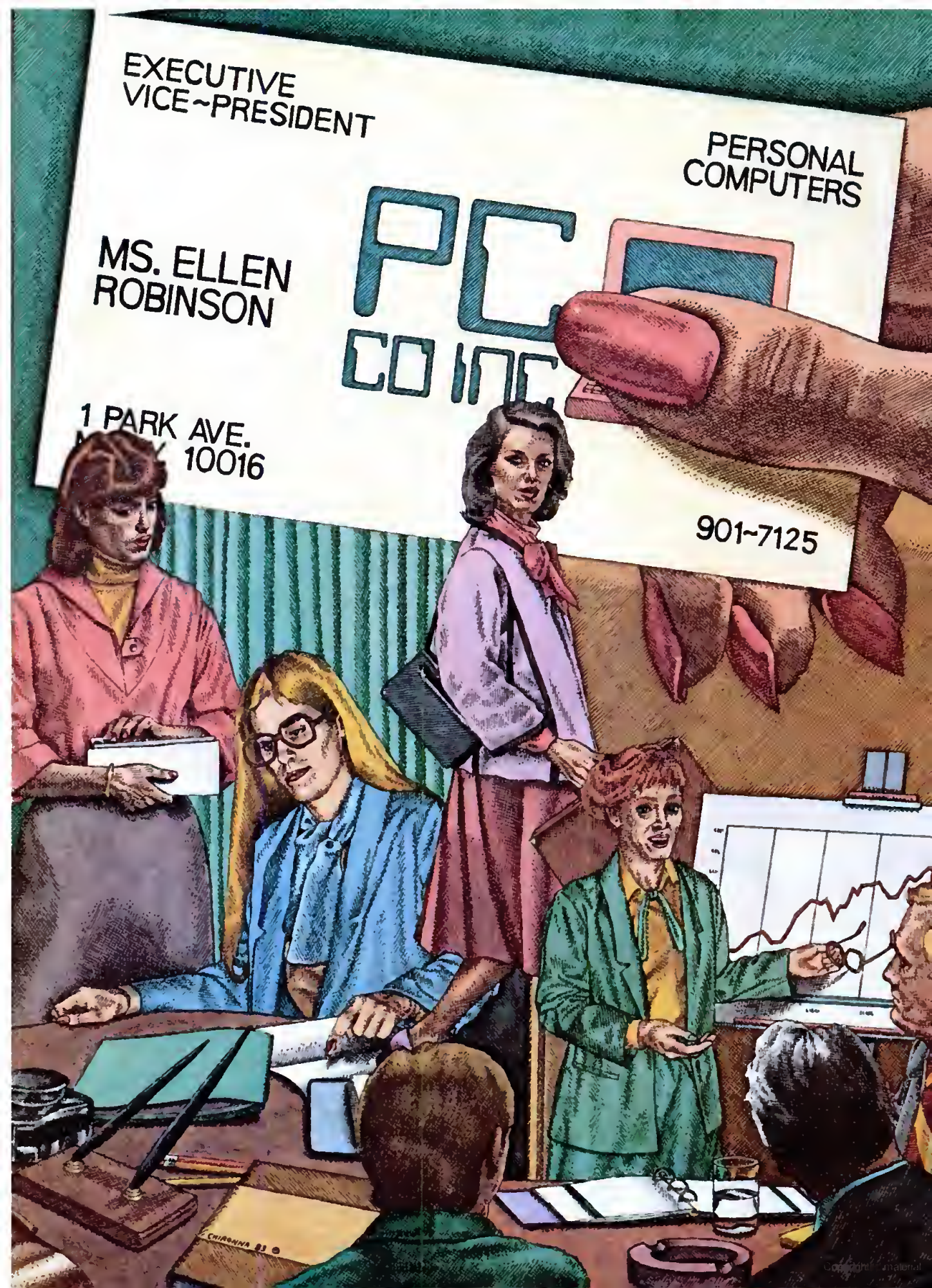
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*The percentage of women in computing is probably greater than you realized, but the industry is dominated by men—for reasons that have little to do with computers themselves.*

# WOMEN IN COMPUTING

Fifty years ago, Sigmund Freud posed the question to his diary, "What do women want? My God, what do they want?" I can tell him exactly what I want: a hi-res RGB monitor, more RAM, double-sided drives to replace the dinky little 160K jobs I bought when the PC first came out, a game board and joysticks, a surge suppressor, and a Compaq portable—for starters. But I'd be tha first to admit to Dr. Fraud (or to my microshrink, Eliza), most women do not share my lust for hardware. The overwhelming majority of my fellow fanatics out there in the global village are indeed fellows—often men whose wives or girlfriands think computers are the dullest things since white boxer shorts.

If you're a sociobiology-minded typa, you might say that all of this is to be expectad, that a fascination with C-compilers is just one of those things that naturally springs forth at puberty, along with male facial hair. (And if so, please turn the page—or better yat, check TV Guide to sae if there's a John Wayne movia on tonight.) But if you're a husband who's starting to feel a little lonesome for a co-pilot for your *Flight Simulotor* (or a wife who's sneaking a peek at this magazina becausa your social life is beginning to resemble one big Superbowl Sunday), please read on.

### A Short Social History

Do you remember those littla joka-tests that kids usa to give to aach other in tha pre-liberated 60s to see if a person was "masculine" or "feminina"? (Sample: What do you think of when you hear the word "ring"? If you're a boy, you're supposed to think of the spot where the heavyweight championship is dacided, and if you're a girl you're supposad to conjure up visions of 14-karats.) In my axperience, that's more or less what happens whan a man and a woman look at a personal computer. What we have hara, despite all our state-of-the-art 1200-baud modems, is a failure of communication.

Bafore I'm accused of gross stereotyping, however, let me hastan to mention that timas are changing. Interestingly, within the computer industry, the gandar gap seems to be closing faster than anywhere else. According to the National Sciance Foundation's most recent statistics, women accounted for 26 percent of all computer specialists in 1980, a 44 percent increasa since 1978. There are undoubtedly many more women in the field today—and the industry, on the whole, appears comparatively unentrenched and ready to



**Famale Anti-Computer Statement #1:** I'm not interested in computers becouse I'm not good ot moth.

walcome anyone who can do tha job. Younger women (like younger men) are especially likely to view computer training as e career necessity. At Mount Holyoka College, for example, fully half of tha all-female graduating class last year was computer literate, up from oniy 15 percent 7 years before. Even tha Girl Scouts have added a compuling meril badge lo their traditional outdoor cooking and tree-identifying repartoire.

## *WHAT DO women want? My God, what do they want?*

"The problem isn't with the profassionel women," eccording to Katharina Davis Fishman, author of *The Computer Estoblishment*. "It's with the woman who doesn't absolutaly have to learn about computers. Woman aren't trained to tinker or to putter with machines just for tha sheer fun of it. For example, most of us look at cars as wheeis thet get you from one place to another, and I think wa tend to look at computers the same wey." Since toying with tha computer is the best way to test it, woman end up looking from tha outside in at what they most often see man doing with computers—crunching numbers and killing aliens.

Even those of us wbo do slip through tha cracks and becoma computer anthusiasts frequantly have a lot of catching up to do. I was forced to learn to usa a word processor whan I was a reportar for a daily nawspapar. I was immediataly addictad, of course, but whan I decided to buy my own computar, I got hopelessly lost in tha brava naw world of intarfacas, cablas, RF modulators, and dip switches. Using the PC es my first reference point for alectronics was an exparianca roughly akin to reading both volumes of Julia Child's *Mastering The Art of French Cooking* in order to learn how to make a TV dinner. (I didn't realize until long aftar I had my PC that concepts like "megaHertz" were general electronics terms, and not computer-specific.) Now I find such things elamentary, but than it was scary in a way that guys who've spent years fooling around with wires and tools can't possibly appreciata.

Luckily, it's becoming increasingly unnecessary to turn yourself into e tachie in ordar to buy a computar. That's what "user-friendliness" and such things as service contracts are all ebout. Which brings us to . . .

Many feminist scholars have documented the phenomenon of "math anxiety" thet often overtekes girls—even math-excelling girls—around the saventh or eighth grade. "Thare's no such thing as a girl nerd," according to Dr. Beve Eastman, assistant professor of mathematics et the William Petarson College of New Jersey. "At that aga, all the pressure is on hair-do's and boys and social things. And while it's considered okay for a boy to really just go off on his own and get involved in meth end scienca, it's still considered unfeminine for a girl." Even among graduate students, abe edded, "the highest proportion of married women students are in math and tha sciences. It's as if you heve to prove yourself as a woman before you can feel good about stepping into that world." Based on observations from har work as e teacber of othar mathematics teachers, Eastman is persueded that adults don't expect high performanca from girls—and consequently don't get it.

## *THE overwhelming majority of my fellow fanatics out there in the global village are indeed fellows.*

Katharine Davis Fishman agrees, "I see an awful lot of parents running out and buying a bome computer for 12-year-old Jaremy, but not too many buying them for 12-year-old Jessica."

It's e very likely possibility that the female "math stigma" can be wiped out in a ganaration, just as the female "sports stigma" seems to be rapidly passing from the scena. But tha ironic thing about computers is that they require less and less math all the time. Long gone are the days when novices had no choice but to communicate directly with the binary brain of their machines. Novices now have access to high-lavel programming languages like BASIC, which are closer to English than to binary numbers. In fect—contrary to widespread misconception—you don't evan hava to learn a programming lan-

guage unless you choose to. A lot of computer novices, not surprisingly, hear the phrase "word processing program" and assume that it means that programming skills are required to use it. If anything, the trend is in the opposite direction.

**Female Anti-Computer Statement #2:** I don't hove ony experience doing *anything like* using o computer.

This one is sometimes uttered by a woman as she pops dinner into the microwave oven, checks her digital wetch, and turns on the TV show she's taped earlier on the VCR. "A lot of women have skills that they don't know they have," eccording to Dr. Paula Leventman, e sociologist who formerly worked for Digital Equipment and is now director of the brand-new Women in Information Systems program at Northeastern University's Graduate School of Engineering in Boston. The program is specifically designed to train women from nontechnical backgrounds for careers in software development and database manegement, both in the Boston-area computer industry and in fields such as health care, banking, and insurance. "A lot of computer people only know computers," she added, "whereas a fast-track English major who's a good communicator can more easily learn a few computer languages and be very employable."

The skill that most directly reletes to e person's potential in programming, according to Dr. Levantman and many others in the computer field, isn't math or science at all—it's music. (Are you listening, all you female piano lesson veterans?)

Frances Quittel, a high technology consultant with The Corporate Service Group Ltd. in San Francisco and an officer of the Bay Area chapter of the Association for Women in Computers (AWC), also stressed that greater keyboard familiarity gives women a learning edge once they actually get to the point of conquering their negative associations and sitting down et the computer. "I've seen an awful lot of English teachers become computer literate ewfully fast," she said. Quittel herself was a linguist before she got into the computer field.

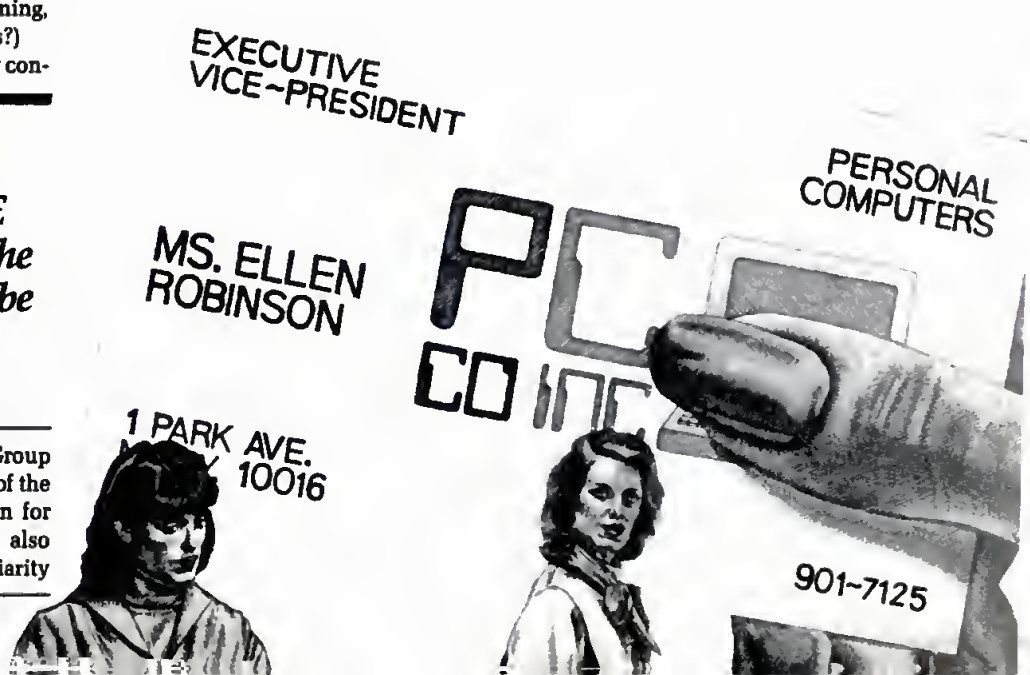
Helaine Head, president of the Manhattan Micro IBM Users' Group, noted thet even where men and women are equally intimidated by computers, men are more likely to be socialized to confront their fears. "I know several guys who specifically bought computers because they could see thet these machines represented a whole new future that they weren't prepared for," she said, "but I don't know any other women for whom that was a factor." Head, whose real-life job is in the theatrical field (she was assistant director and production supervisor for the production of *Porgy and Bess* that opened at Radio City Music Hall in April), is often one of only three or four women among 200 men at computer-releted gatherings. "I've also noticed that just the word computer is a turn-off to certain women," she said. "They like the idea of e word processor better. A lot of us remember the days when a computer was this imposing but elso fragile thing—the whole 'don't fold, spindle, or mutilete' mentality. If that's your association, it isn't going to sound like much fun."

**Female Anti-Computer Statement #3:** *Computers aren't going to make my job any easier.*

On this one, I side with my own sex, and I wish more men would stop and think ebout what "personal computing" means to workers who spend their time keyboarding somebody's else's "personal" work. "The technology may be neutral, but the fact remains that it can be used to abuse typists by keeping count of the exact number of their keystrokes per minute," Dr. Beva Eastman pointed out. In April, Dr. Eastmen addressed a Barnard College Women's Centre conference on feminism and technology, speaking on the subject, "Women's Treuma? Women's Friend? Personal and Political Implications of the

***WITHIN THE computer industry, the gender gap seems to be closing faster than anywhere else.***

***THE INDUSTRY appears ready to welcome anyone who can do the job.***



Microcomputer." Ultimately, she came down on tha "friend" side (she is hooked on an Appla II), but only after acknowledging all the petty, dispiriting, and dehumanizing uses to which computers can be put in the pink collar ghettos where most women still labor. In any case, she concluded, sinca computars are a virtual inavitability in the corporate world, it makes sense for women to learn more about them—and to be prepared to nagotiate for optimal working conditions. (For example, Labour Canada's Task Force on Micro-Electronics and Employment recently recommended that typists not work in front of a video monitor for more than 5 hours a day.)

***THE SKILL that most directly relates to a person's potential in programming is music.***

Frances Quittel of the AWC agrees, "There's a tendency in the business world to think of 'women and computers' in terms of becoming better secretaries. Meanwhile, I see guys putting together venture capital deals and all kinds of creative high tech things. I want to see more women doing that, too."

**Female Anti-Computer Statement #4:** Computers Moy Be Hozordous to Your Heolth.

Since 1979, at least eight clusters of birth defects and miscarriages hava been reported in the U.S. and Canada among women office workers using VDTs. According to the industry newsletter, Microwove News, the clusters include "seven out of thirtaen Air Canada employees in Montreal [who] miscarried during one year; three cases of birth defects and seven miscarriages out of fifteen pregnancies [occurring] at a dafanse contracting offica near Atlanta over one year; [and] eight of twelve pregnancies [with] adverse outcomes at a Sears, Roebuck offica in Dallas within a fourteen-month period." Expert opinion is divided over whether such clusters would be statistically likely, avan if the women weren't using computers, since some 15 percent of all pregnancies end in miscarriages. Nor is there any consensus on what aspects of computers could be causing the problam, if, indaed, they are causing the problam. Radiation, possibly hazardous insulating fluid, increased stress level—leading to more tobacco, alcohol and Valium use—and avan toxic materials from other office machines have all been mentioned.

Various government and industry studies indicate that computers are perfectly safa, but many peopla are not reassured. More to the point: Tha health aspect of computars is somathing women are extremely concerned about—and that men rarely seem to bring up.

**Female Anti-Computer Statement #5:** Computers ore cold ond mechonistic, and they won't enhonce the humon dimension of life.

Wrong. Probably one of the laast publicized technological developments, for example, is the extraordinary work being done with computers for (and by) disablad people. Last year, the National Scienca Foundation sponsored a contest, the National Search for Applications of Personal Computing to Aid the Handicapped; among the items submitted were a keyboard that can be controlled by eye movements and a computer designed to help deaf people learn to read lips. Other innovations include Brailla printers, special security systems to help disabled people call for assistance in an amergency, pocket-sized word processors to help cerebral palsy victims and othar speach-impaired peopla communicata, as well as regular computers, which have opened up new careers for many wheelchair-bound and hearing-impaired people.

Computers can help make art and play music, traca your geneology, check your spelling, and more. What women don't like about computars really has very little to do with computers. What it does reflect is what women don't like about male culture. Which brings us to . . .

**Female Anti-Computer Statement #6:** I hote those violent, stupid video gomes!

"The reason that Pac-Man was such a big success, I'm convincad," said Helaina Head, "is that it was the first game that girls and women could relate to. Gobbling up all those little munchies was a whole lot more appealing than starting a war and killing someona."

As virtually evary Washington political pundit continually points out, there's a definite gender gap on the American scana, and it comas down to tha simpla fact that women don't like violence, real or vicarious. While there's nothing intrinsically violant about microcomputers, it's now a matter of historical fact that men got to them first—and, not surprisingly, programmed them chock full of the sama sorts of gamas they enjoyed playing before. Since gamas are usually tha medium through which people are introduced to personal computers, plenty of women don't look past Three Mile Islond and Crush, Crumble and Chomp.

If you go down to your friendly naighborhood computer store and check out the game packages, you'll also notice that most games hava whita male heroas. There may be a scantily clad space bunny or a passive princess in need of rescuing, but that's about it as far as tha role models for women is concarnad. Evan tha nonviolent and otherwise excellent Microsoft Decothlon requires that famale players pretend to be men. Tootsie aside, would you fallas be comfortabla running around your RAM disguised as Billie Jean King?

***THE HEALTH aspect of computers is something women are extremely concerned about—and that men rarely seem to bring up.***

Still more alianating to the average female consumer was the recent disturbing trend toward software that goes beyond mare woman-ignoring to explicit woman-hating. Tha worst exampla was a game, Custer's Revenge, put out for the Atari by an independent company. The point of the game was to propel General Custer past tha usual hellfire obstacles to a

"squew" tied to e stake—and then rape har. When the Ganaral finally scored, tha Indian women's legs went up in happy submission. The game was finally taken off tha markat aftar massiva picketing and petition-gatharing by Nativa American and woman's groups.

Dr. Beve Eastman doesn't think any real prograss will be mada to intarest women in computars until the software market changes drastically. "There hava been numarous studies in this aree," she noted. "One involvad a hunch of first gredars learning number facts. Tha reward was that you got to kill an alian, and the girls just didn't go for it. When the programmers changed the reward to a dog wagging its aars, thair motivetion pickad up." Eastman thinks adult women might like adventure gamas relating not to fantasy but to real-life problems, such as sexual harassment on the job.

Probably the parson wbo's doing more than anyone for computar parity for girls (and minority boys, and senior citizans, and disabled peopla, and anyona alsa who needs it) is Joen Fischer Targ of Palo Alto, CA. Targ is an educator, e mamber of the faculty of tha Intarnational Institute on Microcomputers in Education at Stanford Univarsity, and presidant of Intaractiva Science Inc., e nonprofit corporation that operates the computer centar et Palo Alto's Jordan Junior High School. Close to half of tha 700 students who have voluntarily participatad in computar training this yaar at Jordan are girls.

*WHAT WOMEN don't like about computers really has very little to do with computers.*

Targ vary deliberetely encourages femala participation hy presenting the computar classas outsida tha aegis of the math classes and by arranging for girls (and minority boys) to ba given tbair initial tutoring by a peer. "We found that if there's e boy around, he'll tand to gat aggressive and start taking ovar the keyboard, and the girl will hang back," she expleinad. In ona particularly significant casa, a sixth-grade girl was assignad a boy tutor and ber twin sister was assigned a girl. The girl wlth tha famala tutor had originally had troubla qualifying for the course. Now she is earning monay taaching adults computar literacy on weekands and during summer vacation. Har sistar dropped out of the program early on. "It's important that whan e girl comes in for tha first tima, she looks at a cless full of strong, competent girls heving e good time using tha computar," Targ said. "After she has the skills, it doesn't mattar. But in that initial contact, kids ought to be eble to be confidant thet their being thare is reasonahle and appropriata."

Still, there are difficulties. Even where tha girls participated in the course and did well, Targ's staff found, thay spant less tima hacking around on the computers aftar scbool and on weekends. "We discovared e coupla of things," she said. "Ona was tha safaty factor. There's much more concarn on the part of parents, especially in tha wintartima, that girls come right bome from school instead of hanging out. Parents lika to know whare they are. Girls also saem to hava more chores et homa, in tarms of Saturday housecleaning and so on, end they're ebla to gat out of tham lass easily than boys. Tha attituda of the parents is likaly to be 'wall, he's a hallion, hut look how smart he is.' "

Anothar problam, ironically, was competition from after-school sports. "Tha boys ere involvad with sports, too, but thay don't taka cartain aspects as sariously. Whareas the girls' coach will tell them to practice 5 days a week and they'll absolutaly listan to him and worry about meking him mad, the boys will realize that thay can take ona or two of those days in the computer room, end 'so what if the coech fumas and fussas?' " Targ has countered these difficulties by "giving more structure to the girls' after-school program." Whan the girls know thet they're expected to show up, thay do—and their parants are more approving.

A big part of the program's concapt is the student as teacher, and kids who'va completad the first phase go on not only to instruct other kids, but to help elderly people and other adult mambers of the community to use computers. (Tha oldest grad was 93.) In addition to being civicmindad, it's turnad out to be strategic as far as the girls are concerned. According to Targ, the girls "invariably mention that the halping part is one of their favorita things, whereas tbe boys rarely do. We've obvlously tapped into something that's meaningful to girls of this aga, but if that's whet it takes to get them interested, that's okay with me. I'm heppy to capitelize on it." Software is simllarly based on things kids—especially girls—like. A particular favorite is the meil-merge exarcise, in which studants pretand to be so popular that thay need to write form lova letters to thair many boyfriends or girlfriands.

*THE REWARD was that you got to kill an alien, and the girls just didn't go for it.*

Targ pointed out that wbile girls may be bandicapped by their socialization, tachnopbobia is an equal opportunity disease. "I recently read that somathing lika 10 percent of all businessmen get physically ill at tha sight of an Apple on e desktop! Can you imagina? Physically ill!"

Katharine Fishman agreed. "I keep hearing storias ebout computer widows," she said. "But I hava an Eagla II, and my busband still doesn't know how to turn it on."

What, you may ask, doas All Of This Mean?

If you're a woman reading this, I'd say it's really up to you. Computers aren't e fad; they're arguably the key to the next stage of humen development. It would heva been nica if we could have narrowed tha gander gap, abolished violanca, and weeded out the roots of technophobia hefore the advent of the computer age. But we didn't. It would he nice if there were a Joen Terg in evary school district. But thare isn't. Tha only way to introduce an opan membership policy to tha computer hoys' cluh of Amarica and to make computers serva the kind of future thet many women envision, is to get those women involvad with computers—now.

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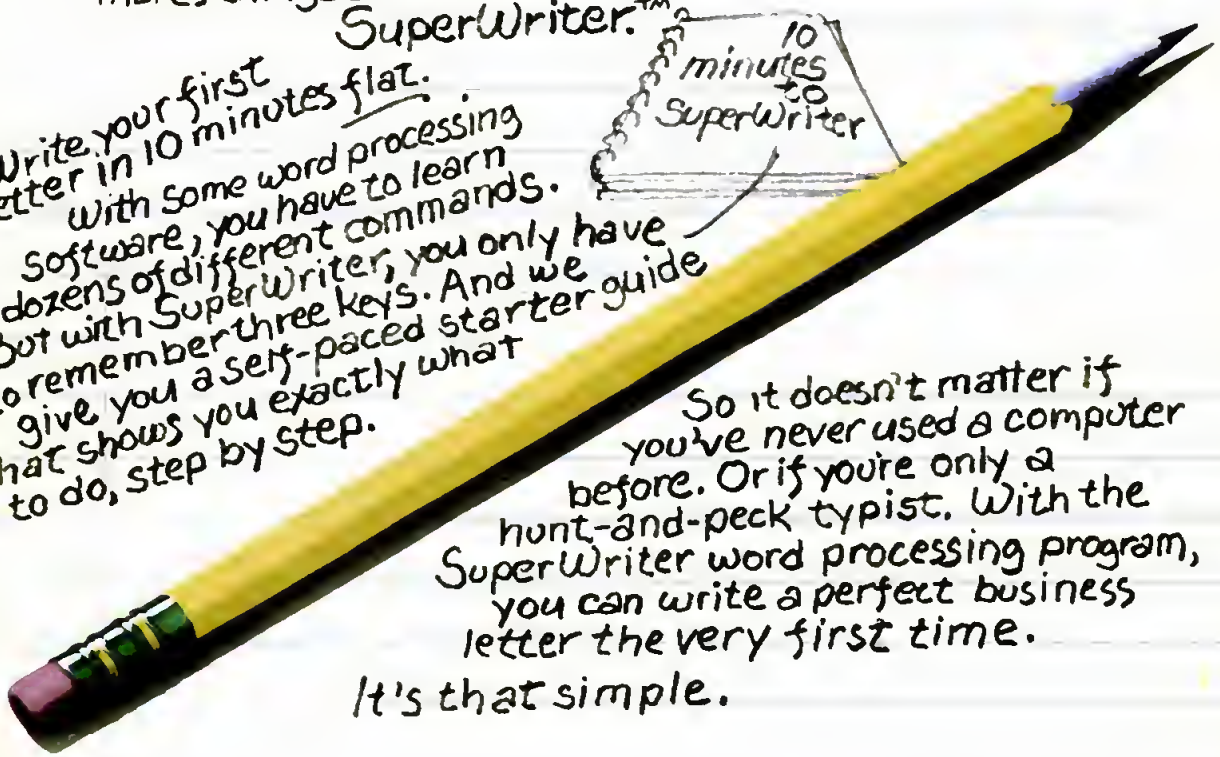
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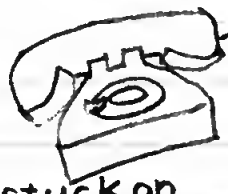
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APPLICATIONS/DONA Z. MEILACH

*Organizations such as DIG SIG, a computer users group from San Diego, set a good example for other PC users. They find ways that computers can help the handicapped help themselves.*

# Helping the Handicapped Through Computers

If someone asked you what segment of society could benefit most from computers, what would you answer? Children? Businessmen? Writers?

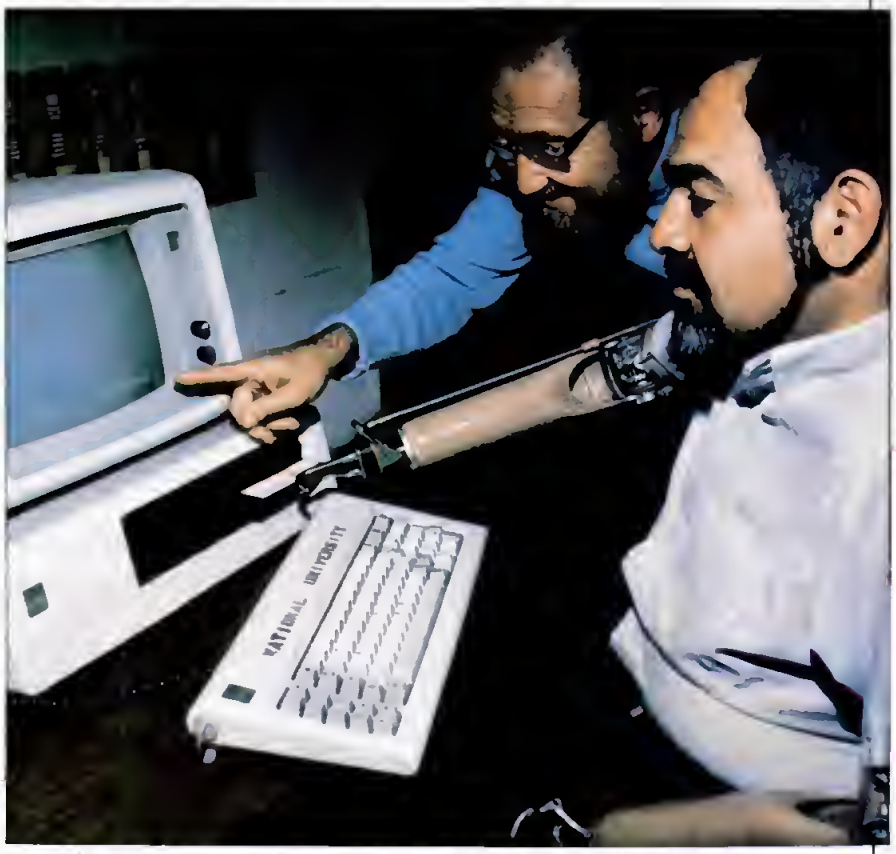
If you were then asked who has the hardest time getting a computer, would you know?

On both counts, the answer is the handicapped.

For those of us who complain because we can't fathom the intricacies of a program or a manual, consider the person who must strike the keys with a mouthstick held between his lips because he has no fingers or no arms.

Consider, too, that such a handicap is only the beginning of that person's frustrations. If the handicapped person has a government disability allowance, he or she is only permitted to own equipment costing up to about $500, or $1,500 total assets including other items in the home. Now what if that person were able to earn some money thanks to the independence afforded many homebound people who can use a computer? This would affect his government income or perhaps cancel it altogether, based on the social worker's view of any new found competency.

These three basic problems—using a computer, acquiring a computer, and struggling with the resulting subsidy



*Fred Gilbert (seated) and Milton Blackstone of DIG SIG, a San Diego computer users' group dedicated to helping the handicapped, experiment with the PC keyboard.*

problems—are only the tip of the iceberg for many handicapped people. If they were given helf a chence, they could benefit immeesurabiy by making the concept of the computerized cottege a reality in their iives. But who will step in and plead their cause? Who can help them tep technology and make it work for them?

### DIG SIG Steps Forward

One answer is every iocel computer society and users group. A prime example is the Disabied Interest Group/Speciai Interest Group (DIG SiG), recently formed by members of the San Diego Computer Society. The approech, goais, and interests of this group couid eesiiy become the guideiines for other groups hoping to heip the handicepped piug into the computer to haip themseives.

Usually, these groups contain people with technical know-how who can essist in revemping switches end input devices to compensate for e handicapped person's inability to handle these items. Those of us who are not handicapped don't realize how hard it is for others to perform the simple ects of turning a machine on and off or pushing a disk into e drive and ciosing tha door. Even the act of hitting the Ctri, Ait, and Del keys simuiteneously is a giant hurdla for ona whose fingers can barely managa to hit e singie key at a time.

Miiton Bieckstona, the originei force behind Sen Diego's DIG SIG, is new to computers, but not to the problems of the disebled. Biackstone, e retired TV producer, has a multi-handicepped son who is blind. As a resuit, Bieckstone has eiways been invoived with the disebled and with tha organizations that devote themseives to their problems. Blackstone realizes how computers cen improve the future of people in the handicapped community.

Not surprisingiy, eil members of Bieckstone's family are oriented to the disabled. His daughter, Jena, is a speciel education taachar married to an engineer. Both are involvad in computers.

Blackstone recalled his own immersion into computers: "When my deughtar and her husband taiked of the technoiogy, it was as though I wes an illiterate. I bought a computer in seif defense. Within e few months, I approached the San Diago Computer Society with the idae of establishing a group for the disabled. Thay encouraged me to try it. By the third meeting, we had over 50 mambers take part in our activities. This number hes doubied during the year."

In describing the primery goal of DIG SIG, Blackstone said, "Initiaiiy, we proposed to seek the ways in which a group could halp handicepped people teke edvantage of the new technology as e means of increasing thair independence and improving their lives in general. From there, the goais proliferetad end we're working to implemant many of them."

*CONSIDER the person who must strike the keys with a mouthstick because he has no fingers.*

Any or all of tha goais develoned by DIG SIG couid be tackled and eccomplished by other groups. Perhaps you or someone in your group couid address the problems of the handicapped and emuiate the ideais that Biackstone outlines.

The world of computers has been introduced to e number of newly interested peopie through workshops and meetings to which tha handicapped community was invited. Members of the computer industry were also invited and their enthusiasm resulted in contributions of unused equipment, edvice, and individuei heip. This espect elone hes eiready resulted in jobs for severai of the handicapped members and has allowad them to iearn how to use equipment that they can work with at home.

Speciei switches and other modificetions that will help the disebled gain access to their equipment more reediiy ere now being daveloped. One company has introduced davicas that wiii eiiow blind or muta peopla to vocaiize their thoughts, opening up a new world for them.

Fred Giibert, himseif disebled, is in cherge of introducing aids end speciai devices for using the computer at DIG SiG. His own apertment is filled with gadgets that could be the dream of eny electronics wizard. Whan tha phone rings, Fred doesn't pick up e receiver from a cradie; he simply steps on e switch and talks into a specially designed telephone. Since Fred can't wear his artificial arms all the time, most of his computer time is spent hitting the keyboard with a chopstick heid between his teeth. Disks ere inserted into the drive using a clip clothespin, elso manipuiated with his teeth. Fred is presently devaloping a call-in bulletin board for the hendicepped end is now trying to find money to launch CRIP-Tonics, Inc., aimad to be a bridge between the hendicapped and industry, and aiming to fiil the needs of both.

### Bulletin Boards

DIG SIG, es e group, is usIng equipment ioaned by the San Diego Computer Society to iog into the Society's buiietin board. The buiietin board wiii enabie handicapped members to call in to request heip and support, to gain access to public programs, and more importantly, to communicete with others whiie in a ionesome, isoieted environment. DIG SIG members volunteer for consultation time, either by phone or in person, to teach the hendicapped how to use packaged software. Fred believes that telecommunications and buiietin boards ere emong the most exciting computer applicetions since they enebie the hendicepped to heip one another, functioning as an integrated group even if they are isolated. He points to a sarvice caiiad ABLEDATA, e nationel deta bank for product information develoned by the Nationei Rehabilitetion Information Center in Weshington, D.C., as an importent development for the disebied.

As more handicapped peopie ere introduced to computers, they think of ways to solve probiems unique to their own disability. Since others are out there with simiier disabilities and simiiar experiences, it's essential that each davelopment be publicized. As Miiton Bieckstone remerked, "there's no sense in reinventing the wheel constentiy."

There are an estimatad 12 million disabied people in the United States end approximately 30 percent have college degrees, many with specielized technicei knowiedge. One eiderly member of the DIG SIG group, who beceme iagally biind during his iata sixties, spands meny hours creating and revising programs that will show other people in the group how to usa their computers to overcome specific problems. "By helping others, I heip mysalf," he said proudly. "I'm a useful

member of the community. Every day, I wake up with an exciting goel to achieve. Without the computar, I'd be anothar nearly blind old man with nothing to look forward to in life. The computer gives me direction, compenionship, indapendence. Somatimes I feel like the Statue of Liberty. You know, 'Bring me your sick, your poor . . .' or whatever the quote is. Bring me your computer problems for the hendicapped. I'll try to solve them."

### National Efforts

Mentioning robotics as e maans of aiding the bandicapped caused Fred Gilbert to grin broadly. "Whet a challange," ha said. "The people who ere the most severely restricted offer the greatest cbellenge for inventlveness end new epplications of robotic devices. Thet's where the future ls."

Several nationel groups heve elready been pursuing the challenge offared by the handicapped. The Rehebilitetion Engineering Society of North America (RESNA), the Medlcal Engineers, and rehebilitation units of hospitals throughout the U.S. beve pursued the challenge offered by the hendicapped. The John Hopkins Nationel Search for Applications of Personal Computing to Aid the Handicapped was made possible by grants, ewerds, and prizes from the Netional Science Foundetion and Radio Shack. Prizes end awards were also offered by compenies and institutions such as Advanture International, Apple Computer, Inc., Byte Publications,

***THE GOALS developed by DIG SIG could be accomplished by other groups.***

IEEE Computer Society, Martin Mariette, Parelyzed Veterans of Amarica, Popular Computing, Taxes Instruments, Inc., and Zenith Radio Corp.

With so many activities on a netional level, it behooves local communitias to aid the cause of tha handicapped in every wey possible. Any IBM users' group could easily eccept the responsibility of conductlng local ectivities for the hendicapped without looking any further then a local hospital with a rehabilitetion center or by talking with a member who mey have e disabled person in his own femily. Indeed, that person mey have been the mein reeson thet the computer was purchesed initielly.

At one of the Sen Diego Computer Society DIG SIG meetings, I interviewed a men who told me, "My 10-yeer-old son has cerebrel pelsy and hes difficulty communicating. He used devices and learning stimuletion evaileble et his school, but we wanted more. I bought the computer end used some of the axisting programs to help him develop greeter eye and hand coordination. I axtanded the bandle on the commercial joysticks so Deve could control them. The game end play situetions were only the beginning."

Both fether end mother learned to write programs thet would help Dave learn by rote and would provide built-in on-screen rewerds whan he eccomplished the objectivas. Deve leernad to raspond to different colors and numbers thet hed eluded him before.

"There was an added bonus we had not counted on," said tha fether, "With a computer in the housa, neighborhood children filter in end out constently to work with tha computer and to see if they cen use tbe progrems we hava devised for Dave. As more children ere introduced to computers in school, thay creva working with them after school. The computer has become e source of tachnological knowhow es wall es human companionship for Dave. It has provided the interection with others we never dreamed would happen."

Todey, there are meny more programs aveileble for the PC then there were only a year ago end several can be used for finding answers to problams of the handicapped. (It's elso possible to adept programs written for other operating systems to the PC.)

### Communication and Employment

Computer peripharals beva enebled some hendicapped people to communicate for the first time. For exemple, voice output eids are now aveilabla for tba blind. Tbe Kurzweil Reading Mechine trensletes printed words into computer-


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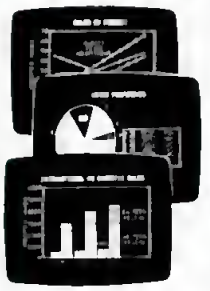
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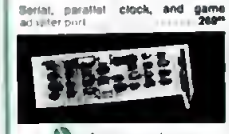
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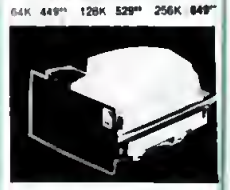
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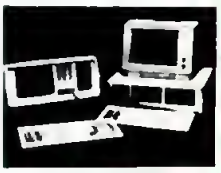
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*COMPUTER peripherals have enabled some handicapped people to communicate for the first time.*

People who are muta or who suffer from savera motor disabilities can use systams that track eye movements on the computer screen. The mouse, joystick, light pen, and digitizing tablet can also be adapted to input and can provida the handicapped with unlimited creative potential. For example, Fred Gilbert mentioned that a former magazine editor, 95 percent paralyzed as the result of an automobile accident, can "read" the New York Times on his computar terminal. The man activates the images on the screen by using a blow switch attached to his clothing in a manner similar to touching the screen with a light pan.

IBM is among the growing number pf companies that are introducing work programs and opportunities for handicapped people. According to a report in one newsletter, IBM has increased its recruitment and training of handicapped workers. Some companies are encouraging the employment of home-bound handicapped workers, allowing them to receive full company benefits even though they cannot work at the main office.

According to Paul Hazen, director of the John Hopkins program, it's surprising that more computer companies have not looked at the handicapped as potential customers. Hazen estimates that if only two percent of the handicapped in this country purchased a personal computer, tha result would be somewhere around $800 million in sales or about 400,000 units. As of this writing, no major manufacturars hava become directly involved in producing computer equipment for handicapped persons.

What Hazen may not have takan into account is the economic situation of many disabled peopie. Although a large proportion can afford to buy units, many are subsidized by a variety of social programs, a situation that raises other problems. Fred Gilbert pointed out that people who receive income from a government source can earn only a very limitad amount of money before it conflicts with tha subsidy. In addition, the amounts they can earn are so small that they can, at best, only supplement the subsidy, not make thamselves self-supporting. This systam actually seems to discourage the handicapped from supporting themselves.

In order to remedy this situation, the rest of us should investigate and lobby for naw laws that will maka tha computer cottage a viable area of activity for the handicapped in the future. According to Gilbert, any polltician who pursues this issue could easily win e placa in Congress. Ha would have the votes of the handicapped and the computer industry, and couid save the country monay as well.

With so much activity already going on among organizations and industry, PC user groups could make a large contribution toward aiding tha handicapped. The catalyst could be one of your own members who, like Milton Blackstone, is dedicated to the cause and willing to work for it. According to Blackstone, "The sparks are thare, everywhare, only waiting to be lit. It doesn't require much to build them to a flame because people respond enthusiastically when the need is great."

*SOME companies are encouraging the employment of home-bound handicapped workers.*


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***PC USER groups could make a large contribution toward aiding the handicapped.***

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The publication *Programs For The Handicopped* reports that "most envision the computer as the hope of the future for the handicapped and predict strong growth in this area." Certainly, PC users could be among those who help make this prediction a reality in the years to come.

*/PC*

*Dono Z. Meiloch writes regularly about computer related topics for many magazines. She is the author of* Before You Buy a Computer *(Crown Publishers) in addition to 65 other books on a variety of subjects.*

**A Note To Our Readers**

*PC Magazine* would like to hear more about adapting hardware and software to the needs of the handicapped. We would also like to learn more about handicapped users employed as computer programmers and consultants. If you have information on these subjects please write to:

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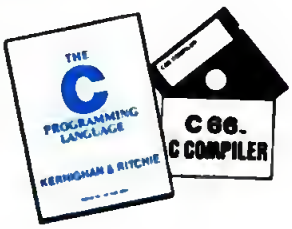
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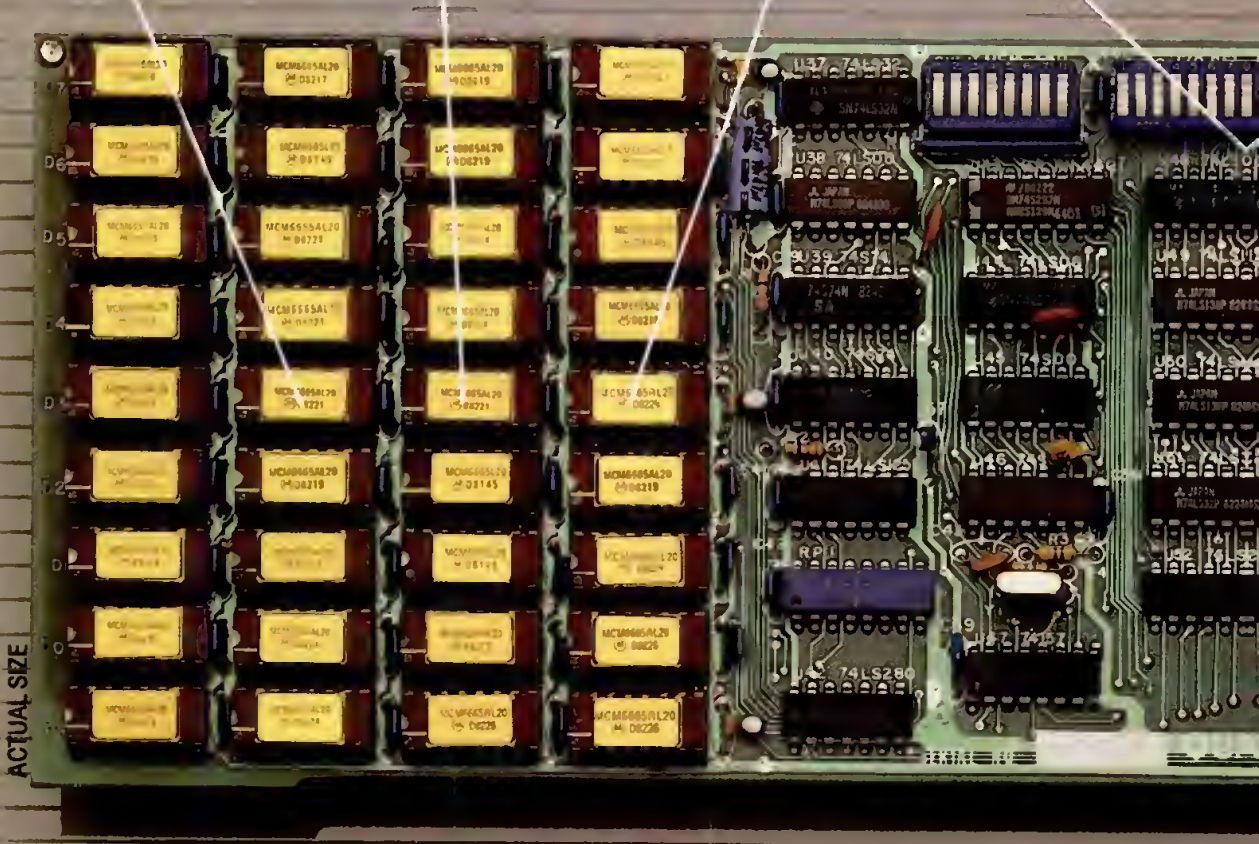
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APPLICATIONS/JOHN JEROME

*Computers can shorten the distance between an idea and a sentence. The question is, "Do they change the sentence itself?"*

# MAKING THE LEAP: A CREATIVE WRITER MUSES ON THE WORD PROCESSOR

Recently I used a word processor for the final rewrite of e book, working from a draft thet I'd originally written on an IBM Selectric. I've never been so embarrassed In my life. It was my sixth book; I've earned a living as e writer for the past 20 years. I bought the computer to reduce the manual labor of my work, but in the process I kept finding myself exposed as a fraud. It was the computer that exposed me. I've nursed e bruised ego ever since.

This wes e second weve of computer anxiety for me, the first lesting for the several months that I resisted buying the machine. Other writers are conquering their computer anxiety and, in their new freedom, rushing into print with I-love-my-computer stories. None of them, however, discuss the effect of computers on their writing. They're not telling us about the most interesting part of the story.

### Computers Moving In on the Arts

Last June, I attended the International Design Conference in Aspen, Coloredo.

*OTHER WRITERS are conquering their computer anxiety and, rushing into print with I-love-my-computer stories.*

An early speaker was Nicholas Negroponte, professor of computer graphics in the Department of Architecture, loceted et M.I.T. in Cambridge, Massachusetts. At the time, Negroponte was serving as the first director of the World Center for Personal Computetion and Human Resources in Paris, created by the French President, François Mitterand. France, we're told, is going to do computers right.

Negroponte, it was announced, had just received news of the develuetion of the franc. He'd gotten the news in his hotel room at 5 a.m.—some time before newspapers and television had received the word—vie his briefcase computer and e telephone hook-up. Having thus wowed the conference with an electronic scoop, he proceeded to tell us tales of chetty computers to come and of the imminent death of newspapers. These stories set the unofficial egenda for the rest of the conference: computer enxiety.

A lot of the assembled desIgners were alreedy quaking at the prospect of computer graphics, which threaten to overwhelm them with indigestibie amounts of leisure time even if they manage to stay employed. Negroponte served up more

Illustration: Stuart Bradford

quivars. Conferees quickly split into pro- and anti-computer factions. Most of the subsequant speakers chosa to insert an element of skapticism into their remarks. Tha session closed with a dabata on artificial intelligenca between Hubert L. Dreyfus (who wrote Whot Computers Con't Do) and Marvin Minsky, resident maven on artificial intelligence at M.I.T. Nothing much was solved in their discussion, but the conferenca was generally electrified—electronicated?—by tha lofty and up-to-date nature of the controvarsy.

Anothar speaker was Michael Crichton, the Harvard-trained physician who now writes thrillers (*The Andromedo Strain, Congo*) and makes movies. Crichton says ha isn't writing much right now; instead, he's computerizing the movie business. He navarthaless spoke more diractly on the subject of computer anxiaty than anyone else at the conference.

***CRICHTON SAYS he isn't writing much right now; instead, he's computerizing the movie business.***

Movie-making, he explained, involves a lot of perfectly impossibla logistics, such as bringing together 12 green 1948 Dodge stake-bed trucks in Saattle at 3 p.m. naxt October 4th, and then, after having done this, leerning thet the trucks are actuelly needed in Puerto Vallarta next Tuesday. What Seattle really needs on October 4th, it turns out, is four paople who can juggle flaming torches, but one of the jugglers has to be fat. Computarizing this sort of scheduling can save a ton of monay.

Except there's this "resistance," Crichton says. Movie art directors, for instance, won't haar him. They ara ertists, thay maintain, and their work is purely creative. There is no wey to reduce their fina judgmants and aesthetic discriminations to the pluses and minuses of computerization. Okay, fine, says Crichton, but what's the most boring part of your job? What do you do badly, what takes too much time and is irritating? What can't you get propar halp for; what are your headaches? Cut out tha most axciting and fulfilling part of your job, sava that for yoursalf, giva all the rest of it to me, and I'll computerize it.

### Writing with a Chainsaw

Computerizing only the myriad minor details is a seductive argument for computars, and a powerful salling point for word processing for writers, too. Using a typewritar is to using a word processor as using a hand ax is to using a chainsaw. Try gatting in a wintar's worth of wood with an ax, and you will understand the source of tha I-love-my-computar stories. Actually, tha chainsaw part of the analogy is a little inexact; the word processor is pleasent to use, end the cheinsew—that daspicable little beast of a machine—is the most axhausting tool I've avar messed with. In my experience, no machine generates more anxiety than a chainsaw.

There ara other, older writers' storias trottad out to justify computer anxiaty. A surprising number of us cling to drudgery as a part of the creative task. We have to keep running tha copy through the typewriter over and over again, we claim, because that's the way we do our thinking. I have a writer brother-in-law who once maintained that he couldn't writa without a certain kind of yellow copy paper because that was the only material that would properly absorb the ink off the typewriter keys. I recall reading of soma wordsmith who typed his manuscripts, taped them to an offica wall, retired across the room, and proofread tham through field glassas. Computar-expert Tracy Kidder, author of Soul of o New Mochine, told me that he can't use a word processor because, as I understood him, his first drafts are almost illegible.

I will bow to no writer in the looniness of my own working habits, but personally, I think we are all nuts.

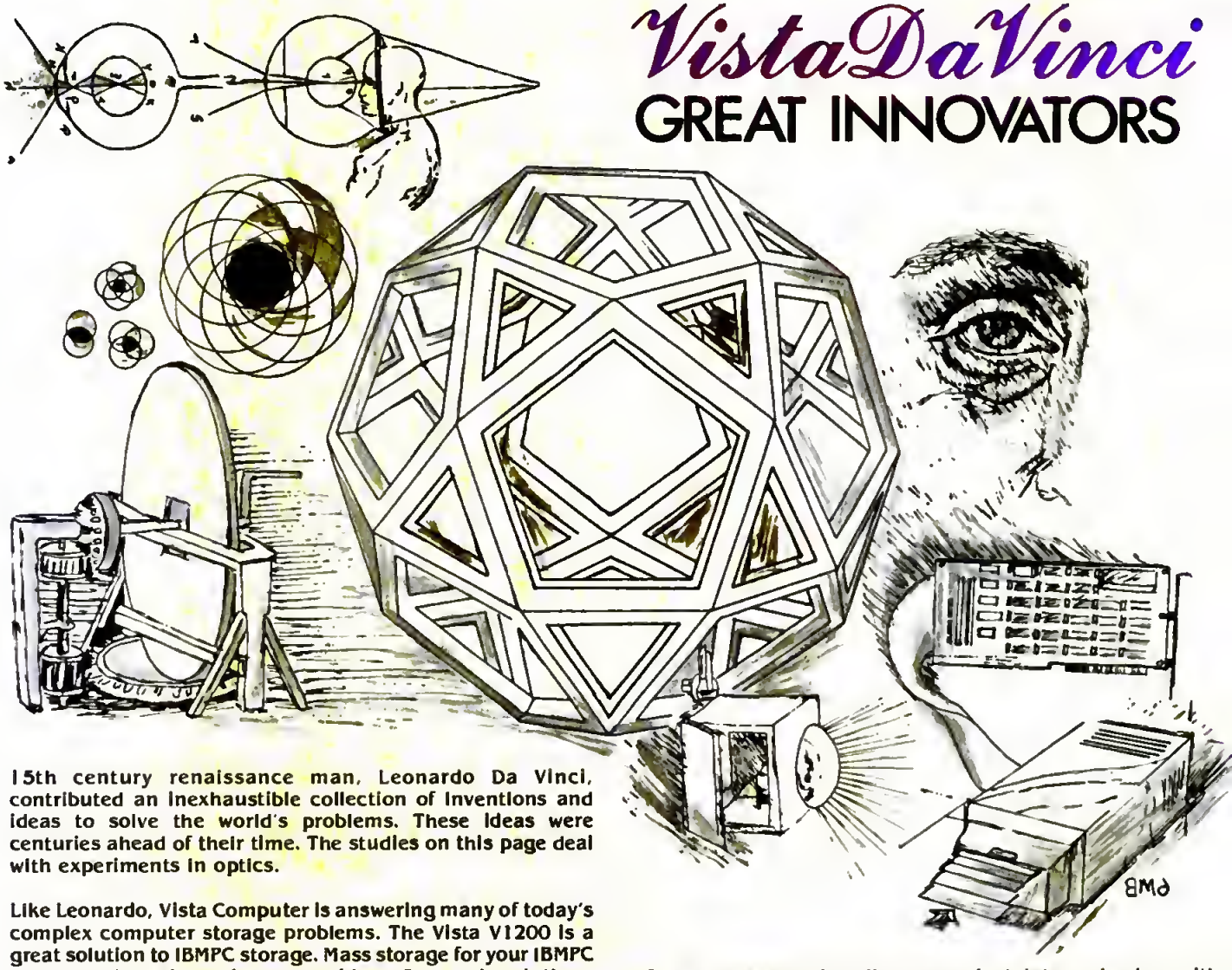
Go nuts for a computar and you will write fastar, of course, which is what most electronic writars' stories are about: the computer as chainsaw. I think you will also write better. The chainsaw metaphor is only trying to say that the computer shortens the distance between tha idea and tha santance. This is the unexaminad part of electronic writing and the source of my embarrassment.

As long as I'va bean writing I'va assumad I was working to increase the effectivenass of my sentences. I had it all wrong. I was simply compiling mental lists of prose gadgets, which, in this case or that, seemed to bang homa the meaning a little harder. At some point, probably around my freshman year, my prosa gadgets outstripped the quality of my thought, and I've had the feeling I'va bean cheeting aver since.

Shirley Hazzard recently wrota about becoming a writer in The New York Times Sundoy Mogozine ("We Need Silance to Find Out What We Think," Novamber 14, 1982). She sprinkled the piece with pithy remarks about shortening the distance



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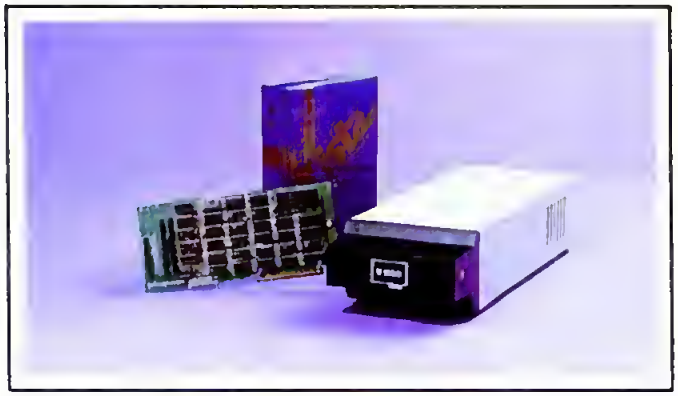
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between idea and sentence. "The testimony of the accurate word is perhaps the last great mystery to which we can make ourselves accessible, to which we can still subscribe," she says. "Every writer who is serious about his craft experiences a sense of profaning pure meaning with unworthy words." She quotes Flaubert (to George Sand): "When I come on a bad assonance or a repetition in my sentences, I'm sure I'm floundering in the false. By searching I find the proper expression, which was always the only one, and which is also harmonious. The word is never lacking when one possesses the idea. Is there not, in this precise fitting of parts, something eternal, like a principle?"

### The Digital Difference

It was the inaccuracy of the word that caused me to blush during my recent rewrite. I had all these habits that I wasn't aware of. Every example was doubled or tripled, underlined, expressed forward and backward (here I go again); every attempt at emphasis racked around into some unnecessarily arch or colorful form. But mostly, time after time, I had simply fudged down onto the page some rough approximation of what I was thinking and then gone on, usually to try the same thought another time or two without getting much closer.

Something about working with the computer made me more ready to admit to myself that a sentence bothered me. Recognizing this meant recognizing that the sentence wasn't saying what I wanted to say. And this was naturally followed by the realization that I didn't know what I wanted to say, didn't know where the thought was headed, was whistling past the graveyard. It was—is—very embarrassing. Almost every trick I ever learned in writing—and I have been guilty of saying that writing was nothing but a thousand tricks—was useful only for disguising an empty sentence. (A few good editors attempted to point this out to me in the past, but I wasn't having any. Hell, I was too good a writer.) Now I have this idea, novel for me, about writing that cuts through all that. I can't do it, of course, but I can conceive it. You might say it is the idea awaiting the word.

*I'VE RECENTLY been reading about "confirmation bias," that tendency we have to make only the observations that confirm our hypotheses.*

What the computer has to do with all of this is the mystery. One clue, I'm sure, has to do with time. The computer automatically elicits hurrying, scrambling, Type-A behavior. It infects you with instantaneousness, with the sense that it should be possible to do everything at the flick of a switch. Once you get used to those little green letters appearing so quickly on that screen, you can't stand it when the machine hums and whirrs for 2 seconds, looking for something else on the disk. Experienced computer-users advise you to buy the fastest printer you can afford, since after the speed of the composing process, waiting for that damned mechanical clatterbox to run off the copy becomes unbearable. Mercedes-Benz diesels once had to overcome a great deal of consumer resistance because you had to wait 5 seconds, after inserting the key, before the glow plug would let you start the car. This sounds idiotic, but it's a maddening delay. That computers generate this fidgetiness is insidious and disgusting and a little frightening, but they do.

After you've worked with a computer for a while, however, you gain some ease and come to know that it's really a chainsaw. You know that it is so fast that the time-consuming production part of the process has become inconsequential. You begin to learn that it isn't necessary to hurry; you've been given so large a slice of extra time that you can afford to be pensive and get it right. I am finally losing the urgency to get to my typewriter to find out what I'm going to say next.

### The Stages of Writing

I've recently been reading about "confirmation bias," that tendency we have to make only the observations that confirm our hypotheses. It reminded me of rewriting. At the typewriter, I start out chuckling to myself at my clumsy writing, rolling in yet another sheet of paper as I go through










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the first or second draft of a piece. By the fourth or fifth rewrite I am commiserating with myself for being stuck with this neurosis that forces me to keep redoing a piece until I think it's right. By the eighth or ninth, I am cursing that neurotic need (the sicker aspect of which is e strong aversion to sending off marked-up manuscript), but I'm still doing it. There eventually comes a time when I am reeding only to confirm that I have it right, to convince myself that this is the final draft, es good es I can make it. Faced with the prospect of yet another draft, I do convince myself. Confirmation bias sets in. Perhaps there's no way to avoid these stages in the development of an article, but it is possible to expedite the process with a word processor.

*THE COMPULSION to produce pages gets put aside long enough to field-strip, clean, and inspect each sentence.*

Enough of neurotic work habits and pointless details. Let's get back to the subject of writing better. There's as much romanticism on this topic as there is about writers' neuroses. I can imagine e piece of writing in which the ideas are so powerful thet the sentences don't metter, but I've never seen one. To the extent that sentences are obstrusive, the power of their ideas is going to be weakened. E.B. White sometimes falls over this edge, writing so well that I spend all my time marveling at the grace and beauty of his sentences, and end up wondering whet the piece was about. John McPhee is catching the same disease, more intent these deys on bowling us over with whet he can pull off than with telling those stories thet make him such e good raconteur.

I suspect the job is to wriggle between these two writerly conceits. The first is the neurotic twaddle about only being eble to write on ivory vellum when the sun isn't coming in the windows on the southeast side of the house; that is, creetive preciousness. Tbe second is the equally romantic intellectual arrogance that only ideas count. Consider most academic writing, which lets accessibility, even clarity go hang. The little people can work it out. One hires secretaries for spelling, you know.

I'll buy the notion that the word is never lacking when one possesses the idea, but this, too, is upside down, implying that the idea will pop into your head and, with it, the word. It implies thought processes more orderly than I can conceive. I don't think you ever possess an idea until you've wrestled it into the cleanest, clearest sentence you can manage, which may also be a romantic notion. Nevertheless, this, in the end, is what the word processor is best for.

### Computer as Taskmaster

A friend and good writer, Jim Conaway, says that one is drawn to the computer prematurely—which is probably true, but dangerous, I think, only if you also leave it too early—and that your sentences "do tend to come out shorter and squarer, as expected in journalism." (He's working in journalism at the moment, and using a word processor.) I bave the opposite problem: The computer strings the words out so fast that I tend to run on and on, and have to go back and chop everything into digestible chunks. My intention is to discard most of the chunks, if I can just maintain the level of attention that lets me see them clearly. They are chunks of ego, of course, and throwing them out is hard.

But the point is that I can go back and chop so easily, and therefore I will. The process is enough fun that I'll go back challenged, instead of resignedly enduring the drudgery. The need to produce pages gets put aside long enough to field-strip, clean, and inspect each sentence. (I bope someday to be able to work my way up to doing the same with each paragraph.) In the process I find that I am more likely, eventually, to possess the idea.

The chainsaw image comes back: The word processor clears underbrush, from having to return the carriage, to rolling in the paper and worrying about the end of the page, to feeling the increasing tension as you come to the last stages of what you hope is going to be e useble page you don't




*"Whither goeth literature, Emily, there also must I go."*

Drawing by Ziegler; © 1983 The New Yorker Magazine, Inc.

went to screw up now and blow 30 minutes of mindless lebor. Every bit of this underbrush is inconsequential detail es far as the creative process is concerned. We ell believe that. But evary bit of it is elso distrecting, pulling soma tiny pert of your mind ewey from wrestling the thought into the sentence.

From this completely mechanistic set of concerns, extrepolete on up through the less purely menuel lebor of writing. Electronics give you complete freedom to invert end switch and fit, to try new constructions, to flip up onto the screen any glimmer of an improvement, consider it, judge it, wipe it out, or neil it into place. Micheel Crichton also says there mey well be too much freedom with the tool, thet eventuelly you heve to stop diddling, bite it off, go to print. I'm sure there's en exquisite decision to be made there, too, but I heven't come to it yet. I'm still looking for ways to improve the process.

A writer I know wrote e 900-pege novel in one draft. He figures thet fiddling with santances and finding more graceful weys of saying things is not going to sell more copies than just getting it said the first way. He'd rather go on to work on other things. This attitude hurts my feelings, for reasons I'd rather not exemine.

*I DON'T CARE IF the images are technically accurate or not, since they enable me to process words easily on the machine.*

I think it's also possible to extrepolete upwerd from what I'm saying about sentences, but I know my own thinking ebout larger blocks of work gets fuzzy. In rewriting a 20-page chapter on e typewriter, by tha time I get to the last five pages, I have little memory of whet was in tha first five. The computer tekes ebout one-sixth the time, end over this shorter period I em much better able to keep in mind whet I'm driving et, to pursue e straight line to the end of the segment. I think. When every chapter has its own disk, when you can so quickly flash onto the screen whole new units, I think it is easier to see the project whole, to keep the requisite number of balls in the air. It's aasiar to try new juxtepositions, new reletionships. I'm not antirely confident of my judgment ebout this, but it seems eesiar, and I certeinly welcome that.

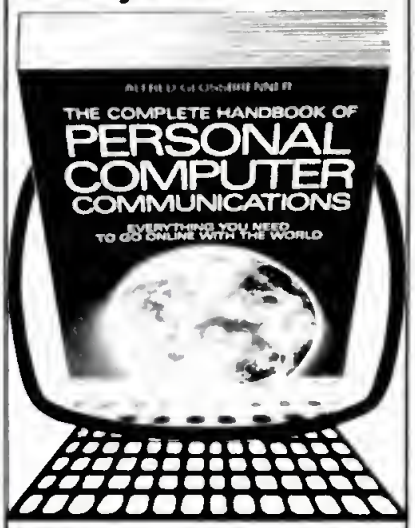
I'm more interested in why, othar than for reasons of hendiness and machanical ease, the computer permits this daeper penetration of one's own work. Why do I find that flashing green electric latters make visible my own confusions, expose my secret fraudulences?

### Computer Metaphors

Learning to operete tha computer was for me a process of acquiring some new metaphors. I'm reasonebly good with machines, but this one was frustrating and incomprehensible at first. I was thinking in the entiquatad gears and levers of my own pre-electronic mechenical universe. Eventually I began to get comfortable with it, and one day it just cracked open for me. As I worked I began to envision what was going on inside the machina through a new set of personel metephors. These have to do with wiring grids and storage spaces, with zipping electrons being sent to this or thet eddress, with direct lines of access and efficient routings. I understand the process of retrievel of stored information, for example—if I understend it at ell—by a set of mentel imeges. These images ere inescapably stylized, for me, by all tha computer graphics in TV ads these days. For others the images may come from computer gemes, which I don't pley. I don't care if the images are technically accurate or not, since they enable ma to process words eesily on the mechine.

When Jim Coneway remerked ebout sentences thet came out shorter and squarer, he was responding to an aarly complaint of mine as I struggled with the computer. I'd begun to went my information in shorter end shorter bits, preferably Anglo-Saxon. I'm sure this is a direct outcome of the computer's Type-A syndrome. I suspect it's elso linked in some cognitive wey to television's brief ettention span. (After 30 seconds without a picture change, a TV producar once told me, e telking head fades into unintelligibility no metter whet it's saying.) I told Conaway thet if we all use computers for 50 years, there won't be any three-sylleble words left in the language. This was early in my word-process-


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## Dot Matrix Printers

Since en IBM PC can drive almost eny parallel printer on the market, software compatability is critical. The larger your software library, the less likely e given printer will work with everything. It's a process of elimination. So if you're just begining, choose software *before* you choose hardware

Remember, too, that no *printer* is 100% compatible with the PC except the PC printer—Epson, Gemini & Mannesmann Taliy printers are the next best things, respectively.

EPSON

## FX, MX & RX



The **MX-80** set new stendards for dot matrix printers yeers ago. IBM graced it with their logo. Nevertheless, Epson haa reshuffled the product line. The **FX-80**, e Prowriter competitor, featurea 150 cps, a correspondence font & a new body (tractor is optional). The **MX Seriee** is being phesed out & the **RX Seriee** will replace it. Call for the latest version & the best prices.

C. ITOH

## Prowriter

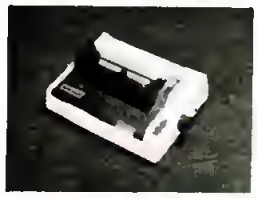


This printer ia a major contender. Reviewers laud the **Prowriter**'s speed (120 cps), the buffer (1.5K), character sets (5 fonts) and graphics (180x144 dpi). It's the printer of choice for several major OEMs. The **Prowriter 2** has the ssme specs, but in a 136 column format. Because delivery is slow nationwide, the **Prowriter** has become "The Printer Worth Waiting For..."

Prowriter ..... **$399.88**
Prowriter 2 ..... **$734.88**

STAR MICRONICS

## Gemini 10/15



**Gemini** printers have been getting a reputation—a good one. At 100 cps, with 120x144 dpi, 5 fonts (w/italics) and a 2.2K buffer, it'a e match for both the Prowriter & the Epson (it's Epson code compatible, too). **Gemini** comes with tractors & uses plain spool ribbons. The **Gemini 15** is the 136 column version.

Gemini 10 ..... **$338.88**
Gemini 15 ..... **$499.88**

OKIDATA

## Microline Series



We use these printers in our offices. **Microline 82As** & **83As** are data crunchers with 120 cps and optional dot-addressable grsphics ROM.

The **Microline 92** & **93** are text processors with 160 cps dreft mode, a 40cps correspondence mode & the graphics included. The **Microline 84** combines full graphics & speed (200 cps) with exceptionel performance (we use the 64 to print our invoices).

Microline 82A ..... **$418.88**
82A/92 Tractor ..... **$58.88**
82A/83A Okigraph ROM .... **$48.88**
Microline 83A ..... **$578.88**
Microline 92..... **$824.88**
Microline 93. ..... **$884.88**
Microline 84 ..... **$1024.88**

MANNESMANN TALLY

## MT-160 L



The **MT-160 L** is the neweat of the correspondence quality printers. It haa speed (160 cps), 6 fonts, parallel & serial interfacea, friction/tractor feed, plus menu-driven installetion for easy set-up from the control panel.

MT-160 L ..... **$788.88**

We sell other dot metrix printers, including the Anadex Series, Centronics Series & IDS's Prism Series. Call (603) 861-9655 for technical details. For prices, or to order, call (800) 343-0728.

## Letter-Quality Printers

Letter-quality printers ere business machines, & very high-ticket ones at that. Most individuals should buy a dot matrix first, edding letter-quality when it's needed. If you must heve letter quality first & foremost, back yourself up with a cheaper dot matrix for draffs: they're faster & the letter-quality printer is reserved for final drafts.

C. ITOH

## Starwriter



The **Starwriter**, released last yeer by C. Itoh, has proven a worthy printer. You don't trade-off speed for price or quality. The **Starwriter** uses Diablo code, wheels & ribbons, haa a 40 cps print speed, 1/48" line space, 1/120" horizontal spacing—ideal for proportional modes. (For real speed freaks, there's the **Printmaster**, at 55 cps. Seme apecs aa above.)

Starwriter Parallel ..... **$1378.88**
Printmaster Parallel..... **$1878.88**

DATA TERMINALS & COMMUNICATIONS

## DTC 380Z

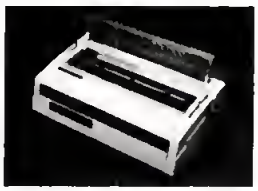


The **380Z** is e letter-quality printer that rivals and replaces the Dalaywriter 2000. It hes the 48K buffer, true Dieblo emulation & uses the Brother/Oaisywriter supplies. The documentation is greet, & the **380Z** even haa pin-outs on the back for esay interfacing (parallel or RS-232C). Eat your heart out Daisy!

DTC 380Z ..... **$1138.88**

SILVER REED

## EXP-550

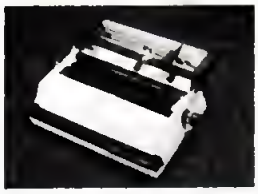


Why buy a Transter when you can buy from the guya who make them? The Silver Reed **EXP-550** is a 16 cps, 132 column letter-quality printer with *true* Diablo emulation, making it compatible with moat word processing software. It's ideal for medium duty office work. Add a buffer & you'll have a versatiile printing system.

EXP-550 (Perellel) ..... **$718.88**
EXP-500 ..... **$CALL**

SMITH-CORONA

## TP-1



The **TP-1** is en ideal second printer for small offices or homes. The trector feed (now available) enhences its paper handling. If you're letter-quality needs are light, thia might be the machine. (Specify 10 or 12 cpi when you order.)

TP-1 ..... **$CALL**

We sell e veriety of other letter-quality printers, including the Dieblo 620 & 630, the NEC 3530, 3550 & 7730 Spinwriters, the Qume 11+ & meny others. Call (603) 661-9855 for technical details. For prices, or to order, call (800) 343-0728.

## Accessories

We carry the accessories below as well as others too numerous to mention, like cables and diskettes. Aak if you don't see it liated.

QUADRAM

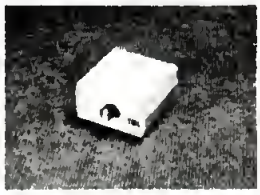
## Microfazer

Quadram's **Microfaaer** is a stand-elone buffer that can be expanded to 512K—that'a about 200 pages. External buffers can be moved from system to system, & they leave your PC memory free. The copy feature lets you print unlimited copies of a document. Comes with its own cable. The power supply is optional.

64K parallel/parallel..... **$218.88**
256K parallel/parallel ..... **$528.88**
512K parallel/parallel ..... **$878.88**
9 Volt Power Supply..... **$18.88**

TBL PRODUCTS

## Printer Switch



We finally found a printer switch box that we like. Switch between two printers, in parallel/parallel or aerial/aerial versions (all female plugs).

2-Way Printer Switch ..... **$118.88**

UNIVERSAL OUTPUT SUPPLY

## Printer Paper

Our pin-fed fanfold paper is 20lb white bond, shipped in a sturdy case. There ere two sizes: 9½" & 14⅞". The wider paper also comes in green-bar.

Paper (9½"). ..... **$44.88**
Paper (14⅞"). ..... **$48.88**


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IBM PC COMPATIBLE

## 64K Chips

We carry 61 64s, 200 nanosecond-type memory chips for upgrading your IBM PC peripherel boards. They're sold in sets of nine eech, & we have quentity pricing for even bigger orders. We also have 16K chips (9/set) for upgrading the PC's mother board.

64K Chip Set ..... **$79.88**
18K Chip Set ..... **$29.88**

## Monitors

Here the "eye of the beholder" holds egeinst eny spec's. Our fevorites ere listed below. Remember to get the Color Grephics Card, nof the Monochrome edepter.

USI

## Pi Series



We're *still* using e **Pi-3 Ambar** that we edvertised lest summer. The 20MHz bandwidth gives the highest resolution available, & we like the nononsense case & controls. Uses both SO-239 or RCA phono jack. Ceble is optionel.

Pi-2 (12" green)..... **$138.88**
Pi-3 (12" ember) ..... **$158.88**
Pi-4 (9" amber) ..... **$158.88**

PRINCETQN GRAPHICS

## HX-12

The **HX-12** is, without dispute, the highest resolution RGB aveilable for the PC. 16 colors (using NEC's tube), 690 dots by 240 lines, 15MHz bandwidth & more. The **HX-12**'s case styling is identical to IBM's. It comes with its own cable.

PGS HX-12 (RGB) ..... **$528.88**

QUADRAM

## QuadChrome

The **Quedchrome** hes the same spec's es the HX-12, but with the Quadrem neme. Seme price too.

Quadchrome (RGB)..... **$529.88**

We elso carry Amdek Colors 1, 2 & 3, Electrohome's 1302-1 & 1302-2 Series, NEC's JC-1203, Quadram's QuadChrome & Zenith's ZVM-121. Call (603) 881-9855 for technical details. For prices, or to order, call (800) 343-0726.

## Modems

There's a boom on in telecommunications, and to be part of it you need a modem & software. As with printers, the software determines most things, like support of the modem's features (the "bells & whistles") & the ability to communicate with a given device. *Check things out!* Communications can be a nightmare if you're guessing, & easy as pie when you know what you're doing.

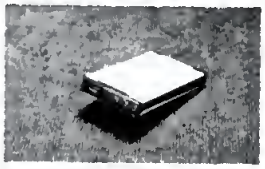
## US Robotics **Password** **$379.88** UPS DELIVERED



An exceptional value for a 1200 baud modem. The **Paaaword** is e direct connect originete/answer type modem with 0-300 & 1200 baud capability (Bell 212A compatible). Feetures include euto diel, euto answer, auto mode and auto speed aelect, full & helf duplex (local echo), DTR override, RS-232C pins 2 & 3 reversible & audio phone line monitor. Single button operetion mekes the **Paeeword** very essy to use. Comes with an RS-232C ceble, power eupply & moduler telephone cable.

DC HAYES

## Smartmodems



The Heyes **Smertmodem** has eerned en enviable reputation for quality, reliability & performance. The **Smartmodem** features full/helf duplex, auto diel/enswer, programmability in eny languege, English/numeric result codes & either 300 baud (Bell 103) or 300/1200 baud (Bell 103/212). It comes with modular cable & power supply. The RS-232C cable is optionel.

Smartmodem (300)..... **$219.88**
Smertmodem (1200)..... **$538.88**

We also carry the Novetion Auto Cet & SmertCat Series & US Robotics. Cell (603) 881-9855 for technical details. For prices, or to order, call (800) 343-0726.

## Expansion Boards

AST RESEARCH

## Megaplus

The **Megeplue** uses one slot, but it hes one parallel port, two RS-232C ports, e clock end software (SuperDrive & SuperSpooler). Add more memory in 64K increments up to 256K. The **MegaPak**, at 256K, is a piggy-back card.

64K Megaplus..... **$339.88**
256K Megaplus ..... **$499.88**
Megapak 256K..... **$289.88**

**I/O+**

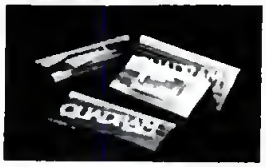
The **I/O+** has a parallel port, a RS-232C port, a game port, a clock & software, but no memory.

I/O+ ..... **$199.88**

Connect All ..... **$24.88**

QUADRAM

## Quadboards



We sell **Quadboard**s because they consistently perform better than any other board we've seen. They come with 64K & 256K on-board, a parellel port, e RS-232C port, e clock & the software (QuedDrive/Spooler). The **Qued 812+** is a memory board with a RS-232C port, Single function boards ere elso available. Quedram products sre werrentied for e full year.

64K Quedboard ..... **$278.88**
256K Quedboard..... **$428.88**

**812+ Expansion**

Qued 512+ (64K)..... **$238.88**
Quad 512+ (256K) ..... **$399.88**
Qued 512+ (512K) ..... **$599.88**

**Memory Only**

64K Memory ..... **$199.88**
128K Memory..... **$255.88**
192K Memory..... **$309.88**

**Single Function Cerde**

Clock/Calender..... **$85.88**
Parallel Cerd..... **$88.88**
RS-232C Cerd..... **$85.88**

QUADRAM

## QuadLink

A real breekthrough! **QuedLink** lets you run Apple II/II+/IIe software in the IBM PC. It's like having a 84K Apple computer installed in your PC. **QuadLink** uses stenderd PC printer ports, monitors, etc. No disk co nversion or reformetting required. Takes up only one slot.

QuadLink ..... **$549.88**

MEMBER DIRECT MARKETING ASSOCIATION

## Disk Drives

Internal hard disks have only one weakness: they bring the whole system down with them if they need repair. It peys to configure with *two floppies* first, then edd e hard disk that can be detached for service if need be, leaving you otherwise operational.

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## Hard Disk

We took our QuCeS Herd Disk Subsystem out of its box, plugged it in, turned the power on & never bothered with it egein. These units ere rugged, reliable & easily interfeced. It's become e minor legend. QuCeS werranties their hard disk for e full yeer—en exceptional thing in this business. Comes complete, ready to run.

12Mb Hard Disk..... **$2058.88**
20Mb Herd Disk..... **$2388.88**
40Mb Hard Disk..... **$3839.88**
Big Blue..... **$478.88**

MAYNARD ELECTRONICS

## Disk Controller

These controllers fill the bill for snyone building the PC from scratch. The **Meynard Floppy Disk Controller** hendles two internal drives (A & B) plus two externals. Comes plain, with e parallel port or with a serial port.

MFD Stenderd..... **$188.88**
MFD w/parallel..... **$219.88**
MFD w/RS-232C..... **$255.88**

IBM PC COMPATIBLE

## Disk Drives

Tandon is our primery source for drives, but we've used MPI & Control Dete without eny trouble. We'll use drives of equel quelity if Tendon's eren't on hand—seme es IBM does.

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All our equipment is shipped factoryfresh, with full warrenties. We're euthorized for werranty work on e number of printers, & we elso offer extended werranty plens for those printers.

Sorry, we cannot eccept open POs or extend credit/terms et these prices. APO end foreign orders ere not eccepted.

We prepared this ad in April, & prices do change, so call to verify them.

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CIRCLE 152 ON READER SERVICE CARD

ing career, but I still think this shortening of units of thought is one of the computer's less benign effects.

That effect is belenced, I hope, by the usefulness of the metaphors by which one operates the mechine. I think the computer's reduction of the distance between the idea and the sentence is one of those metaphors. Once you stert using mentel pictures of informetion routes and direct lines of access to think ebout the writing process, you begin to rethink the structure of your sentences. No, that's not right, you eren't thinking ebout the writing process, you're just searching for the cleenest structure with which you can display the ldee. Once I became committed to reducing the distance between idee and sentence, I began to get the confidence to kick loose all (well, some) of those gadgets by which I hebituelly propped up the rickety structure of my thought. Organ stops ere what they ere; this old metaphor is perfectly ept. They are only tricks that slow the electron in its passage by diverting it from the straightest possible line. Electron, in this case, is e metaphor for comprehension.

Or meybe not a metaphor; scientists distingulsh between those parts of our thought processes that ere herd-wired into our brains and those that are not. I wouldn't be surprised if comprehension didn't occur at the closing of some hither-to-open circuit, ellowing neurel signals to flow unimpeded. Meybe that solid click of comprehension, the feeling thet makes you say, "Got it," is a bunch of neural switches flipping into place, electromegnetlc contect mede across the synepses. It feels that way to me since I have been writing electronically.

***THE COMPUTER shortens the distance between the idea and the sentence.***

**Are Programmers Immune?**

I don't went to know anything ebout progremming, but I seem to remember reading somewhere, probably in Tracy Kidder's book, thet programs don't beve to be very efficient. The computers have so mucb memory available that the programmers can take eny old route, use unnecessarily complex and cobbled-up means of getting from point A to point B within the progrem. Thet immediately implies that there are sloppy programs and elegantly simple ones, and programmers to match. Maybe I do want to know about programming. I think I'd like to be eble to understand what would make e program elegant. I think this would teach me something about sentences.

Or meybe not; it doesn't seem to help the computer people. There may be a reflection of sloppy programming in the legendary unreadability of the printed matter that accompanies computer gear. All instruction, for hardware or soft, is perfectly impenetrable. If this meteriel represents the quelity of the mentel pro-


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CIRCLE 501 ON READER SERVICE CARD

cesses of the programmers, one doesn't dare think ebout the hidden contents of their programs. My wife is e professional proofreeder, and much about computers offends her. As she points out, a mispleced comme—or any other aymbol—can wreck e program. How can these peopie, who must be so precise with computer symbols, be so blithely uncaring ebout the other symbols, the ones thet make up their previous language? Okay, I'm not ready for programming yet.

### Electronic Thinking

I have no sense es to whether this computer infiltration is working for good or ill, but I do think it is elready changing us. By some combination of subliminal imegery and practical demonstration, computers are teaching us to think, to work, ln different ways. The difference seems syntactical somehow, which is why I think lt'll show up most emphatically in electronic writing. It's very stimuiating, as change alweys is. I think it'a weird that in all the computer talk these deys, I heven't heard anything about this from other sources. I'll bet the cognitive scientists are already hard at work on these things. I'd check it out, but I find their writings more impenetrable than computer instructions.

I know whet I hope the word processor does for me: I hope it keeps teaching me more direct ways to get from the idee to the word. So far it keeps teasing me with visions of bony sentences, of sentences that slip home the idea of how electrons zip through the circuitry. I keep imagining bits of light thet arrow through unimeginable microcompiexities, that snap unerringly into the heart of the remaining discontinuities. These visions make me want to write sentences thet don't do anything but fill the last gap necessary to make the idea come clear. I notice that I continue to fail, but it'a fun trying.

For me, the switch to a computer has been very fruitful. The only problem is, sometimes I don't know whether I can deal with the density of ldeas generated for me by thia particular junction of writing and electronics. I sald density, I dldn't say anything about quelity. */PC*

---

*John Jerome ia the author of The Sweet Spot In Time (Summit Books and Avon), and is a frequent contributor to Esquire and Playboy.*


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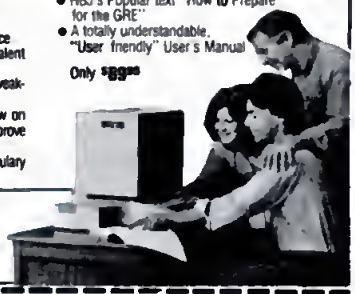
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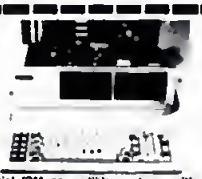
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CIRCLE 300 ON READER SERVICE CARD

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It's true! Now you can enjoy the power of the Intel 8088—the same microprocessor which powers the IBM-PC—and run any program compiled for the IBM-PC...starting at only $399.95!

Take this easy, low cost way to learn 16-bit technology! Two-board system features:
1. 8088 mother board with 5-slot expansion bus; accepts any hardware designed for IBM-PC; and
2. 64K memory board, expandable to 256K; with IBM compatible RS232 communications port.

Any disk-operating system which works on the IBM will work directly on the EXPLORER 88-PC, and all programs compiled for the IBM will run on it.

The system monitor ROM included in the Starter system features a user-friendly operating system that allows easy programs generation and debugging. The commands include display/modify memory...display/modify registers...input/output data to I/O ports...block moves...single-step trace mode...go/run with optional breakpoint and register reports...cassette load/save with file labels...plus a complete system test program that tests and reports condition of ROM, RAM, cassette interface, timer, DMA controller, interrupt controller, and the communications port. These test programs not only allow easy debugging of software but they serve as hardware and software learning tools.

The EXPLORER 88-PC STARTER KIT includes a mother board, memory/I/O board, all components needed, sockets for IC's aand, one 62-pin bus connector and complete assembly/test instructions. All you need is a soldering iron, solder, a power supply, and a standard RS232 terminal (Netronics has 2 low-cost ones to choose from).

Explorer 88-PC Starter Kit...$399.00
+ 15.00 p&i
☐ (wired & tested, add $100.00)
☐ Extra 62-pin connectors at $4.25 ea.
+ 1.00 p&i.

Use your own terminal with the EXPLORER 88-PC or, if you plan to expand it to be fully IBM compatible, we offer our IBM compatible keyboard and an IBM compatible color graphics board (only available wired and tested).

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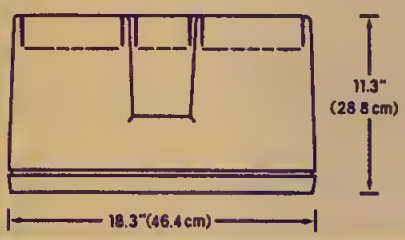
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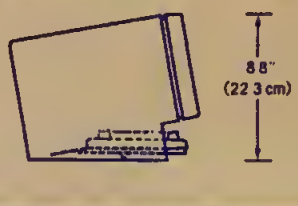
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CIRCLE 252 ON READER SERVICE CARD

HARDWARE/MARK ZACHMANN

*Quadram Corporation introduces an impressive conversion card that persuades PCs to accept many—if not all—Apple programs.*

# Quadlink: An "Appleboard" For The PC

Quadlink
Quadram Corp.
4357 Park Dr.
Norcross, GA 30093
(404) 923-6666
**List Price:** $680

**CIRCLE 624 ON READER SERVICE CARD**

Quadram Corporation calls it Quadlink: a new product as unusual in concept as in dasign. What it does is let your IBM Personal Computer act like an Apple II. The design phase for the Quadlink card is complated. Quadram has been tooling up and expects to begin delivering Quadlinks by midsummer at a retail price of $680. The card is aimed at large companies that already have a substantial investment in Apple software. It will allow a company to purchase IBM PCs without having to sacrifice its investments in Apple software and documentation.

Other potential users might include schools that wish to train people on different microcomputers. With Quadlink, a single PC accommodates software designed for at least two different computers.

The Quadlink fits into a single slot in the PC expansion bus. The PC disk-controller cable is plugged into the Quadlink and connects from there to the drives.




*Figure 1: An IBM PC running Apple software using Quadlink by Quadram.*

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The IS PipeLine is Patent Pending.

*Centronics is a trademark of Centronics Data Computer Corp.

CIRCLE 311 ON READER SERVICE CARD

Also, the PC video display cable is routed through tha Quadlink. According to Quadram presidant, Tim Farris, installation will be aasy. The prototype I looked at had a number of cables sticking out through the rear of the PC's case.

*CERTAIN software that uses half-track copy protection would not run on the PC due to differences in the drives.*

Quadlink shares the PC drives and display. You can use tha PC with standard PC-DOS and two drives or run the special Quadlink program and have, in effect, an Apple with the same two drives. There is no need to unplug the video display: the display is automatically switched to the Quadlink display.

The Quadlink display seems to mimic tha Appla display perfactly. Even the imperfections apparent in a 24-by-40 display designed for color TVs were visibla on the prototype configuration. Quadlink does have one advantaga. You can plug it into an RGB monitor as well as a TV and get a highar-quality display.

Although the card seems to contain circuitry that acts like the Apple disk-controllar card, I was told that certain software that uses half-track copy protection would not run on the PC due to differences in the drives.

Rathar than put tha Apple ROM on a Quadram card (potentially a litigation-inspiring maneuver), Quadram elected to provide 80K RAM of memory on the Quadlink. This allows tha card to be loadad like an Appla language card and to accommodate boot programs that can talk to the PC serial and parallel ports.

Thus, the Quadlink providas an Apple emulation with disk-drive controller, video display, 64K of usabla RAM, game port, and the 6502 microcomputer, all on one card. Of course, with tha PC, you also have an upper and lower case keyboard. All serial and parallal communications (as well as the keyboard control) take place through the PC. Although tha prototype hook-up did not produce any sound, I was told that Quadlink will also shara the speaker with the PC, so that shoot-em-up gamas can hava the proper noises.

### Exceptions

Tha most-likely problem with tha Quadlink is copy protection. Many of tha Apple programs are copy-protacted by using a technique called "half-tracking." With half-tracking, information is actually written between the usual tracks on a disk. Software copy-protected in this way will not run on the Quadlink card.

Another thing to watch out for are programs that read the Apple keyboard ports or serial and parallel ports directly. Becausa these functions are built in on the Quadlink, this approach will not work.

Some Apple software also uses pieces of the Apple ROM that exist at specific locations (much like the PC software interrupts). Although I don't know for certain, my guess is that some of this softwara will not work with Quadlink.

If you have visions of setting up a bunch of psaudo-Apples using a number of Quadlink cards in a single PC, you can also forget that. A single PC cannot accommodate more than one Quadlink.

It appears as if a large proportion of tha available Apple software will run using a PC and tha Quadlink card. Quadram insists that about 90 percent of the Apple software runs; in this manner, but the sample was too small to be typical.

The Quadlink card will run on a PC-XT, but it cannot take advantage of the XT hard disk.

### My Observations

I went down to Quadram with a pila of Apple software to test. Due to a misunderstanding, I did not have the opportunity to try the prototypa. After a short interviaw with Mr. Farris, I found out that the prototype had been whisked away for further software development (despite the fact that my previously-sealed software had been opened). One can only wonder.

Anyway, I did gat to sea the prototypa running something that cartainly looked like Appla DOS. It signed on with tha usual Appla II prompt and the funny looking 24-by-40 display. We also got to try one game, and it appeared to work satisfacto-



rily. Certainly the graphics looked excallent, although no noise came from tha speakar. The Apple disk is considerebly slowar than the IBM disk.

If Quadlink works at least as wall as the prototype I saw, it probably daserves epplausa. Designing a full Apple II on a single IBM PC expansion card is no mean feat.

### Quadlink and the Apple IIe

Quadlink was designed to emulate the Apple II. Any software that runs on the IIe end also on the II, should run using a Quadlink card. Software that takes advantage of new features of the IIe will probably not run using Quadlink. Quadlink does contain an uppar- end lowar-casa keyboard, e faature both tha IIe and the emulation share. Another common trait is the 64K, which comes standard, not expandable, on Quadlink.

### Summary

Cards such as the Z-80 CP/M-80 emulators heve been, well, not overwhelming successes. In part, this wes due to tha rapid convarsion of axisting Z-80 software to tha IBM PC. The 8088 micoprocassor in the PC is vary much like the Z-80 procassor, so that software conversion was a fairly simple task. Also, most Z-80 applications assumad charecteristics that the PC shares, such as a 24-by-80 display and a full ASCII kayboard.

*YOU WOULD certainly have to be a games fanatic to be willing to spend $680 just to transport your existing library of Apple games to a new machine.*

The Appla, on the other hend, is so totally unlike a PC that converting applications is a far more difficult task. A 6502 microprocessor chip (used on the Apple) has e complataly diffarent instruction set and registar setup. The display on the Apple comes standard with graphics; tha resolution is different from that available using a PC color/graphics adapter. The memory organization of the two machines is quite different. Finally, the Appla is a fairly old, static design. This has caused program designers to use charactaristics that are mora hardwara-dependent than those dictatad by CP/M-80, which is naturally hardware-independent.

The end result is that the Quadlink provides a far chaapar solution to running existing Apple software than converting the software to a PC. Conversion would imply assantially rewriting the software and documantation from scratch.

Howevar, I am not so convinced of tha need for en Apple amulator. My subjective opinion is that, apart from games, very little substantive software exists for en Appla. VisiCalc does run on an Apple, but VisiCalc files are completely portable from machine to machine. And the instruction set is nearly identical.

Time will tell, but you would certainly have to be a games fanatic to be willing to spend $680 just to transport your existing library of Apple games to a naw machine. Perhaps Tim Farris is right that the best prospects are companies that would like e more capabla computer that does not make existing software, training, and documentation obsolata. Hope they don't pick a IIe. */PC*

## The Short Sweet History of Quadram

*In this business quick response time is as important as a good idea.*

Quadram Corporation was formed in 1980 by Tim Farris and William Strange. Tim Farris has a background in angineering and manufacturing, while William Strange has a background in marketing and finance. They made a very good team. Strange is formar owner of a retail computer store, and as a result Quadram's products were eimed at that market.

Quadram's first few products in early 1981 were add-on cards for the Apple II and some printer buffers (tha Interfazar and Microfazer line). When the IBM PC came out in late 1981, the partners rushed down to the local ComputerLand. They were excited by tha technical documentation, and actually designed their first card for the PC (a 192K add-on memory card) from the manuals alone. The product was out in less than 2 months. Other products for the IBM PC (e dual printer card, a battery-backed-up clock) followed quickly.

In early 1982, Quadram counted about ten employees and could boast of a modest sales record. Strange's experiences on the road for the company led to the decision to take the four previous cards and integrate them into a single (and very successful) unit, the Quadboard.

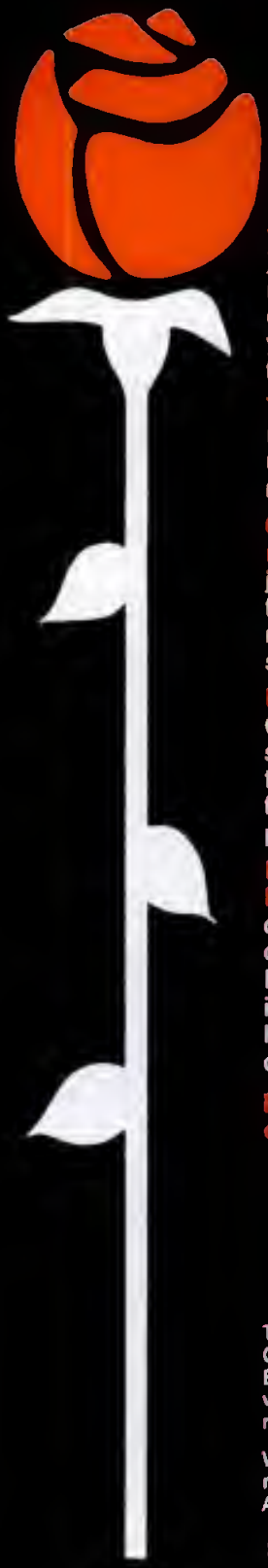
Today, Quadram has about 200 employees. It still sells plenty of Quadboards and MicroFazers and is beginning to branch out into other products. Farris insists that Quadram has no plans to produce a microcomputer of its own. It is strictly an enhancaments manufacturer.

*FARRIS INSISTS that Quadram has no plans to produce a microcomputer of its own.*

All production on Quadram products takes placa in Atlanta. The company is finishing a naw building, which will contain three times the space that Quadram now occupies. —M.S.

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To run ProKey, you'll need an IBM Personal Computer or work-alike (COMPAQ, Corona, Eagle, or Columbia Data Products), DOS (any version, including 2.0), and 64K of RAM (WordStar requires 96K).

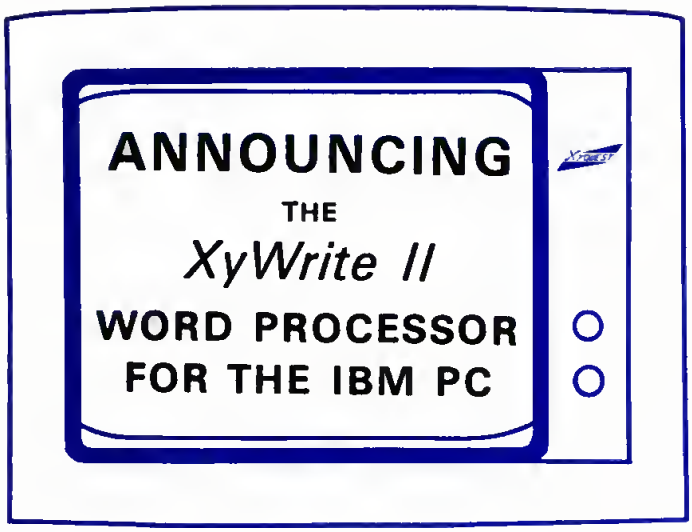
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HARDWARE/COREY SANDLER

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# COMPAQ: Have



# Computer Will Travel

Compoq Portoble Computer
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12330 Perry Rd.
Houston, TX 77070
(713) 890-7390
**List Price:** $2,995; second disk drive, $595.

**CIRCLE 699 ON READER SERVICE CARD**

They call the Compaq a portable; I would call it a "movable." It's not exactly as convanient as a pocket calculator, unless you have an awfully big pocket—big enough to carry tha equivalent of a 28-pound sewing machine around. Still, the Compaq is infinitely more portable than tha PC. You can pack it up and put it down elsewhere without much trouble.

The Compaq lists for $2,995, a price that includes 128K RAM, a sharp 9-inch green phosphor monitor, color/graphics and text display card, a parallel printer port, and one double-sided disk drive. A second disk drive is $595. The machine is said to accept any expansion card designed to run on the IBM PC.

I gave the machine a pretty rough test. After using it for a week on my desk, I packed up this near-clone of the PC and took it home for tha weekend. Now, understand that home for me these days is a bit of a trek. First the Compaq and I endured rush hour on New York's Lexington Avenue uptown subway to Grand Central Station. We didn't get much respect, either, particularly when we became temporarily wedged in tha narrow confines of the turnstile. Then we got on Amtrak's Electric City Express for the nearly three-hour ride to Albany, New York; the Compaq sat up top in the luggage rack.

We arrived home late and I just couldn't wait to find out how well the machine had taken its first train ride. I unsnapped the keyboard, removed the cardboard protectors from the disk drivas, and fired up the computer to begin writing this review. Though my arms ached and my bum knea still throbbed, the Compaq worked as well as ever.



*Compaq with side panel lowered to show part of interior.*

Photography: Jack Reznicki

### But Is It Compatible?

As I mentioned, the Compaq is a near-clone of the PC—and almost a full work-alike. To put it another way, if 28 pounds of rock is a "0" on a scale of compatibility, and the IBM PC is a "10," the Compaq portable would score high, about a "9.7."

Nearly every program that runs on the PC works on the Compaq immediately, and most other PC programs can be made to run after a bit of fiddling and disk-operating-system swapping.



*Interior of Compaq. Manitor is at lower left, drives at lawer right, od-on boards and holf of mather board ot tap.*

## *THE COMPAQ CORPORATION has released a list of nearly 100 programs it says will run on the machine.*

The Compaq comes with Microsoft's MS-DOS 1.1 operating system, which is almost identical to PC-DOS 1.1. Also included is a version of Microsoft GW-BASIC, also nearly—but not exactly—identical to IBM BASIC 1.1. It is, however, significantly different in the manner in which It is entered into the computer. Compaq's BASIC is resident on disk (a whopping 54,000 bytes or so) and not in a proprietary ROM à la IBM. What are the implications of this arrangement? To begin with, you cannot load IBM BASIC Into the Compaq because it immediately looks for instructions from the ROM chip, which isn't there. You can, however, run Compaq's BASIC on the PC, but you would have to make allowances for a very large language file.

What will the Compaq run? Any Word processor, spreadsheet, utility, or game based on PC-DOS 1.1 should work on the Compaq, provided that the COMMAND.COM file comes with it. You may have problems with programs that look for the firmware ROM of the IBM machine for copy-protection or other purposes. Tbe Compaq Corporation has released a list of nearly 100 programs it says will run on the machine. The software includes *1-2-3-, IBM Accounts Poyoble, IBM Accounts Receivoble, IBM Asynchronous Communicotions Support, CP/M-86 Operating System, Crosstolk, dBose fI, EosyWriter 1.1 ond II, MBA, Multiplon, pfs:file, pfs:report, TIM III, UCSD Poscol, VisiColc, Volkswriter,* and *WordStor.*

## *THE MAKERS of the Compaq had to find a way to make their machine as much like IBM's as possible without violating copyrights.*

I wrote parts of this review on the Compaq, using PC's COMMAND.COM and the PC versions of *Wordstor 3.2* and *ProKey*. Later, I ran the same disks In the PC in my office. I was also able to bring up Spyder, a game reviewed in Volume 1 Number 12 of *PC Mogazine*, but only by loading the game from a PC-DOS A> prompt rather than from an MS-DOS A> prompt.

The use of BASIC and BASICA on programs common to both machines presents another area of complexity. As students of the IBM PC know, the machine itself did not represent a breakthrough in technology at the time of its introduction. In essence, IBM took existing technology and packaged it in a competent and attractive unit. The areas that could be patented and copyrighted were few, basically involving the ROM chips, which bring the computer to life, provide instructions on various utility functions for input and output of data, and supply part of BASIC. One peculiarity of IBM's set of ROMs is the division of the BASIC programming language into three parts: Cassette BASIC, Disk BASIC, and Advanced BASIC. The cassette part of the language on the IBM machine is wholly resident in ROM; Cassette BASIC is the BASIC language display that comes up on the screen of an IBM Personal Computer if there is no disk mounted in the A drive at boot-up. If you use a cassette recorder for entry and storage of programs, Cassette BASIC is as much of the programming language as you will have access to. The next

two segments of BASIC on the PC are supersets: Disk BASIC builds upon Cassette BASIC; Advanced BASIC (BASICA) builds upon both Disk BASIC and Cassette BASIC. The version of BASIC on disk is therefore incomplete. When you enter BASIC or BASICA, the machine loeds the needed constituent perts from both ROM end the disk.

Not so on the Compeq. In developing their clone, the mekers of the Compeq bad to find e wey to meke their machine as much like IBM's es possible without violating copyrights. Consequently, the porteble clone has its own Basic Input/Output System (BIOS), which, while functionelly equivalent to IBM BIOS, is distinguished by e different design and its own version of BASIC, in this cese loaded from the operating system disk. The Compeq hes elimineted the seldom-used cessette port (something IBM elso did in its new PC-XT extension) and with it, Cassette BASIC. As a result, users are presented with just two levels of the progremming language: BASIC and BASICA. The system disk includes three files: BASIC.COM (502 K), BASICA.COM (500 K), and BASICA.EXE (53,780 K). So though the BASICs are functionelly the same, you cannot run IBM BASIC on the Compeq.

To use the Compeq, you must be certain that your programs contain the eppropriate version of the language. You mey, for example, bave a program thet requires booting up under IBM's PC-DOS and Compeq's Microsoft BASIC to run. In any case, it would probably be to your edvantage to buy e copy (at $40) of IBM's DOS, though this is not steted in the Compeq manual. DOS 2.0 works on Compeq, but with the same exceptions for BASIC.

*IT TOOK Adam Osborne to bring the microcomputer out of the sacristy and into the hands of taxi drivers, bellhops, and luggage handlers.*

### The Clones Are Sent In

Time was when expensive pieces of electronics were treeted like fragile holy shards, never to be touched or (Heaven forbid!) bounced or jostled. Even when the supposedly sturdy microcomputers made their appearance, most owners felt thet their devices hed to be treeted with the respect ordinariiy accorded e vial of nitroglycerine. Of perticular concern were the disk drives, with their precise elignments end delicate record/pieyback heeds, and the gless video-displey tube.

It took Adem Osborne to bring the microcomputer out of the sacristy end into the hands of taxi drivers, bellhops, and luggage handlers. His Osborne I, by most standards a significant business success story, wes the first of the "portebles." The machine looked like e cross between an Army mobile telepbone and e Singer sewing mechine. Its tiny 5-inch (diagonal measurement) white-on-bleck screen wes its primary drewbeck.

Next ceme the Kaypro, which took the same basic ingredients (including the 8-bit CP/M opereting system) end added e 9-inch green phosphor monitor end lerger capecity disk drives. The Kaypro looked like e bomb-squed oscilloscope in its "strictly-business" metel cese.

*PERHAPS IT is Compaq's aim to limit all under-the-cover work to authorized dealers.*

And now, the Compeq—the first of the portebles to use the Intel 8088 central processor, and therefore the first that can legitimately claim some measure of com-

*Front view of Compaq showing graphics on monochrome screen.*



# COMPAQ: A Technical Overview

*Good design and sturdy components set this portable apart from other "me too" PC imitators.*

The Compaq Portable Computer offers IBM-compatibility and some portebility. Its case is designed to withstand the rigors of transport from one placa to another. The keyboard snaps onto the front of tha mechine, covering the 9-inch monitor screen and the disk drives. Two sliding locks bold it in plece. The power cord nestles into e recess covered by e sliding door with e positive datant lock. When tha door is removed, the recess is the exhaust port for the system's cooling fan. You can't close the door when the power cord is in plece, so you don't beve to worry ebout cooking the innerds. Everything outside is tough molded plastic.

### Inside View

All the components are held securely by aluminum cages and brackets. Screws end locknuts ebound; nylon standoffs prevent the main board from flexing. A lid goes over the top of the expansion slots to prevent cards from coming loose. The overall impression is one of solidity end quality. There can ba no doubt thet those who angineered this machine were serious about tha possible negative effects of its being trundled around. It is rugged.

*THOSE WHO engineered this machine were serious about the possible negative effects of its being trundled around.*

There are five expension slots on tha motherboerd, with two of them filled by the video displey card end the floppy disk controller. The motherboard hes the usual 8088 running et 4.77 MHz, supported by the 8259A interrupt controller and the 8237 direct memory access (DMA) controllar. There is e socket for an 8087 math cbip. I wes somewhet surprised to see thet there ere six 28-pin sockets for reed-only memory, with two of them occupied by 2764 ROMs. The sockats are selectable by dip switches on the motharboard, so there is quite a bit of room for expansion or for custom software to be burned into ROM. The folks et Compaq heve no immediete plens to use tha extra ROM sockets.

RAM memory is ebundant: 128K is soldered in, and tbere are sockets for another 128K. Our test machine had tha full 256K complement. The eddress decoding is done by custom-programmed arrey logic (PAL) chips, and the boerd is designed to eccept 256K memory chips when thay become commarcially evailable. Naw PALs and 256K chips will permit the theoretical maximum of one megebyte to be held on the motherboard, but the ectuel amount will ba somawbet less due to decoding restrictions for the ROMs and other pre-allocated memory addresses.

### Display

The video display board bas the standard 6845 colorgraphics controller chip and is capabla of driving the internal monitor or tha external monitor of your choice. Character generation is e little different on the Compaq. The computer uses e very dense displey mode for its internel monitor, giving beautifully-formed, highly-legible charecters. They are reminiscent of the quality you get from one of IBM's melnframe terminals. This displey mode is incompetible with most externel monitors, so en elternete, compatible display mode is provided. Tbe Ctrl-Alt > and Ctrl-Alt < keys toggle the displey from one moda to tha othar. The IBM-compatible moda is coarser, but not objectionebly so.

During my tests, I hooked up e new IBM color monitor to the Compaq and found thet it needad the coarsar moda. I keyed in the command and was greeted by a bright flash from the Compaq's screen and a distinct click from inside the machina. It sounded very much like a high voltage arc. I toggled the moda a faw more times end found that the sound wes being produced by e relay in the video monitor. Out of curiosity, I called the manufecturer to ask for an axplenetion of what was going on in there. It turns out thet the internel monitor ectually uses a differant scan rate to displey tha characters, and the video board has a different character set that maximizes readebility. There is elso en edditionel graphics character set eccessible by changing e jumper.

*THE BOARD is designed to accept 256K memory chips when they become commercially available.*

### Disk Drives

The two standard-height floppy disk drives are unexceptionel. The controller card handles just two drives. On the eluminum chassis, mounting holes for e pair of half-height drives in the A position are readily discernible. The people at Compaq aren't confirming or denying, but it looks as if the next model will hava two half-height drives and a Winchester. What the people at Compaq will confirm is that they are doing some extensiva invastigation into those Winchesters they consider rugged enough to be lugged around.

Tbe power supply, et 120 watts, is cer-

tainly robust enough to handle two half-height drives and a Winchester. It turns out that the existing supply is capable of handling 120 or 220 volt input, but there is no provision for switching to 220 outside the case. An upgrade will soon be offered to correct this—good news to international trevelers (and their ranks are growing) who need to teke their computers elong.

### The Keyboard

The Compaq uses Key Tronic's "soft touch" keyboard. There has been e lot of controversy about the feel of this keyboard. The Key Tronic board does not heve the "over-center" snap action of the IBM keyboard, but it does have a form of tactile feedback. Each key has a two-stage spring, a light one for the first half of the keystroke and a heavier one for the second half. Key closure is made just before the transition point, so when your finger feels the higher resistance, you know that contect has been made. You don't have to think about this; the feedback just becomes part of the typing process.

*THE PEOPLE at Compaq aren't confirming or denying, but it looks as if the next model will have two half-height drives and a Winchester.*

From the standpoint of quality of tactile feedback, nothing surpasses the over-center form. but there is more to keyboarding than over-center clicks. First. the length of the keystroke tends to be longer on the IBM keyboard, simply because you have to actuate the clicker. On the Key Tronic board, you do not have to bottom the key to get a clean keystroke with feedback. If you ere feeling perticularly hemhanded, the heavier spring that soaks up the second half of the stroke absorbs your pounding nicely. Second, the over-center click has whet I consider a fatal flew. Essentielly, the click is too loud and the springs resonate. So you hear these continual tings and pings as you key away. I find it annoying. Key Tronic makes this keyboard in a number of keyboard layout versions. This one is a clone of the IBM layout. I would have preferred one closer to the Selectric layout. Perhaps there will come a day when you can cboose your keyboard layout when you buy your PC or PC-compatible machine.

The worst thing about the Compaq's keyboerd is the coil cord attaching it to the computer. It is too short and stiff to allow you to move the keyboard any appreciable distance from the machine. It is also permanently attached at both ends.

### Compatibility Problems

When the Compaq wes in development, there were some compatibility problems with some of the commercial progrems written in BASIC for the PC. Some of the critical timing loops were written in BASIC and involved operating system calls through the ROM. Compaq's ROM executed these calls faster than IBM's, causing problems. The cure was to lengthen the execution times of some of the routines. The manufacturer claims that other efficiencies in its ROM cause the machine to be faster overall, but the difference is scarcely noticeable.

In summary, I like the Compaq a great deel. It is well-engineered and has many nice features that set it apart from the "me-too" IBM imitators. The peckaging is excellent and the documentation is on a par with IBM's. —*Bill Mochrone*

patibility with the IBM PC. This portable is also the first of its kind to have a "finished" appearance. The outside cese (made of a solid plastic) looks like a sewing machine, but once you open the case by unlatching the keyboard at the bottom, en attractive desktop microcomputer is revealed. On the model I reviewed, two 5¼-inch double-sided Control Data Corporetion floppy disk drives sit side by side on the right. (The lowest-price configuration of the Compaq includes but one floppy drive.) On the left sits e 9-inch (diagonal measure) long-persistence green phosphor monitor. A single rotary control allows adjustment of screen brightness.

*IN THE best clone manner, the Compaq provides three near-twins to the IBM manuals.*

Two compartments are built into the sides of the machine. The left section stores the electrical plug and houses the on/off switch end a mini fuse compartment. On the right side is the access panel to the five expansion slots. The Compaq is sold with cerds in two of the slots: the displey card, with outputs for externel composite or RGB monitors, end the disk controller, with e parallel-printer output port.

The keyboard, manufectured for Compeq by Key Tronics, is attached to the computer by a coiled cable. The board features Key Tronic's standard soft touch, which some typists love and others loathe. (See "Key Tronic's Soft Touch," PC Volume 1 Number 9.)

A sturdy, well-padded retractable hendle provides the cerrier with e touch of comfort.

In the best clone manner, the Compaq provides three near-twins to the IBM manuals. The three slip-cased ring binders—*Operotor's Guide*, *BASIC Reference Guide*, end *DOS Reference Guide*—are very well presented, and ere in many weys en improvement in

both writing and organization over the IBM originels. There is, however, one very important omission: The guides leck instructions on how to remove the cover of the Compeq, how to instell options, or how to set system switches.

### The Disassembly Line

Perheps emboldened by the fact thet we did not own the Compaq but had borrowed it from the manufacturer for purposes of review, we decided to figure out how to open up the case by ourselves. It wesn't eesy; there are no visible screws or clips on the outside. We finelly determined that a peir of screwdrivers twisted into two of the unmarked slots on the side would pop off the plestic outer shell.

*THE LONG-persistence 9-inch green monitor presents one of the sharpest images I've seen short of a plasma display.*

Inside we found a sturdy metal cage surrounding the electronics. The cege serves not only as protection but elso to cut down on redio frequency interference from the machine. Working agein on instinct end not instructions, we loosened six screws and removed the cover over the expansion card bus. Directly in view were a pair of system switches very much like those on the IBM PC. In our experiments, we used the IBM Guide to Operations and other IBM literature to set the switches.

Perhaps it is Compaq's aim to limit ell under-the-cover work to authorized dealers. It would seem that if one of the selling points of the company's porteble is the fect that most or all of the hundreds of hardware options for the IBM can be used with the Compeq, then the user should not find such obstacles in his wey.

### Does Compaq Pass the Test?

Probebly. But not without attention. Within a week of arrival, the little red light on the A disk drive geve up the ghost. The very quiet drive continued to work well. About a week later, the letter *U* on the keyboard began to generate double letters from time to time. A while leter we noticed an intermittent flickering of the monitor, a condition that apparently cured itself (perhaps when it wes jounced the other direction). These ere not irreperable problems, of course, and they could eesily crop up on eny computer, but they mey elso be indicetive of the worries the owner of e porteble mechine mey fece.

When you purchese a new IBM PC or a new disk drive, you receive a free eccessory—a disk-sized piece of cardboard thet fits in the drive end prevents the heads from chettering together in transit. In most cases, the cardboard is dumped inside the PC pecking crete and left untouched until or unless the computer is to be moved or shipped. Obviously, e portable computer like the Compeq is expected to be moved reguiarly, end one would think there would be a more permanent solution offered. Whet comes with your purchase? The seme cardboard separetors.

I was also a bit discomfited by the manner in which the keyboerd wes etteched. The cord from the keyboard wes tightly wound and permanently affixed to the computer. I found it difficult to keep the keyboard at a comfortable distance from the monitor—it kept wanting to slide forward to rest egainst the computer itself.

### Some Pluses and Minuses

A few nice touches: In compensetion for its reduced size, the long-persistence 9-inch green monitor presents one of the sherpest imeges I've seen short of e plesma displey. The demonstretion programs that come on the Compeq DOS disk are very well-designed end include a "leser" that peints the company's name on the title page and a cute trademark "bug" thet treverses the screen. The demonstretion also includes e diagnostic testing procedure thet allows you to run through the full battery of tests without having to stop and respond to eech "error messege" es it occurs (a procedure adopted by IBM in its PC-XT diagnostics program).

A few annoying minuses: The Compeq produces a subtle little click over its speaker es each key is depressed, a nice touch considering the silent and (to some) indistinct feel of the keyboard. However, the menual edvertises e control to increese or decreese the loudness of the clicks, using the Alt key and the plus (+) or minus (−) key. Try as I did, I could discern no chenge in volume. Further, the computer's fan is noticeably noisier than the PC fan, sometimes to the point of distraction. This is probebly due to the demands of the iarger power supply end the built-in monitor, which produces some heat. Nor wes I satisfied with the angle edjustment for the computer/monitor. Two sets of legs cen be extended, but I found the monitor too low for comfort. I ended up propping the Compeq up on a few copies of my fevorite computer megazine.

### The Compaq Compact

None of my reservetions ebout this computer were enywhere near mejor. The system worked, all of my software ran, it accepted ell of the hardwere we tried to plug into it, and it substantielly survived severel major treks as well es uncounted trensfers from one desktop to another.

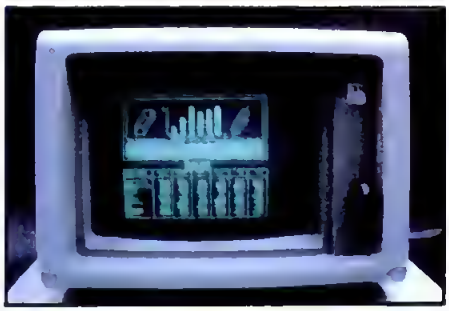
My knee end I will retain our reluctence to clessify this as e true porteble: It is porteble in the seme sense as a 19-inch television is "portable." (I will reserve ewerding e certificate of full mobility to eny computer until it fits in my briefcese.) However, I can easily imegine an eccountant heading off for a week's essignment out of town with e Compeq; a writer could bring one along for a week's retreet in the woods; a company could invest in a set of Compeqs for temporary assignments around the office.

*MY KNEE and I will retain our reluctance to classify this as a true portable.*

There is one other consideretion: If you buy a Compaq, you are buying e mechine that is missing three letters—*I*, *B*, end *M*. If that is not e problem, then it should be enough to know that this is e well-designed, well-manufectured end well-positioned microcomputer, certainly worth consideretion by anyone seeking to run IBM PC software without an IBM PC. */PC*





# ARTIST

## Two High Performance Graphic Controllers for the IBM Personal Computer.

ARTIST transforms the IBM-PC into a graphics work station that would sell for over $30,000. Tektronix 40XX emulation software allows the IBM-PC to interface with mainframe graphics software.

Output frequencies are adjustable for any monitor. ARTIST can drive the IBM monochrome display with 16 levels of intensity and 11 patterns of shading.

ARTIST has its own graphics library accessible from any programming language under PC-DOS or QUNIX. ARTIST also supports CP/M-GSX which provides communication to printers, plotters, and digitizers.

### FEATURES

- 16 colors
- 16:1 display zoom
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- Solid & dotted lines
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CIRCLE 165 ON READER SERVICE CARD






# THE TRS-80 MODEL100: NEVER AN IDLE MOMENT

*This elegantly-designed, briefcase-sized computer may not always be compatible with the PC but by-and-large, they get along famously.*

*TRS-80 Model 100 Portable Computer*
Radio Shack
Fort Worth, TX 76102
**List Price:** $799 with 8K RAM; $999 with 24K RAM. Upgrades of 8K (to maximum of 32K), $119.95 each, plus installation. Batteries included, AC-adapter and cassette cord optional.

CIRCLE 588 ON READER SERVICE CARD

The TRS-80 Model 100 Portable Computer is not compatible with the IBM PC. Why, then, is it appearing in the pages of PC Mogozine? Simply because this micro microcomputer is so well-equipped and practical that it makes direct disk-to-disk compatibility seem irrelevant.

Radio Shack's Model 100 offers a tool for business people, writers, and travelers straight out of the once-amazing days of



Dick Tracy and his wristwatch television set. The penlight-battary powered Model 100 allows you to take your office on board a plane or train or car, and then transmit or transfer your work to your comparatively-huge IBM PC.

It would not be aasy to write an entire book using the Model 100, but you could readily work on a chaptar while commuting to work or flying across country. There is not (at least yet) a way to davelop a full-blown electronic spreadsheet analysis on tha Model 100, but you would be abla to load data and analyses from a larger computer. Tha 32K maximum storage/operations memory will not allow maintanance of a larga databasa on board, but the built-in modem and communications software should make it very aasy to use the Modal 100 as a remote terminal.

## Smaller Than a Breadbox

Radio Shack's new computer is not much larger or heavier than the issue of PC Mogozine in your hands. Yat it includes a full-stroke keyboard, an LCD display screen that shows, with propar lighting, aight lines of 40 upper- or lower-casa characters. In a single line directly above the alphanumeric keyboard are eight programmabla function kays, four preset command kays, four cursor-control buttons, and a built-in direct-connection modam.

The standard 32K ROM contains a full-featured version of Microsoft BASIC, a limited but usabla word procassor, a telecommunications package that can transfer files to or from other microcomputers and connect to networks such as CompuServe and the Dow Jones News Service, a clock/calendar with time schedular and appointment recorder, and a telephone directory and auto-dialer. Oh, yes—there's also an RS-232 serial port, a Centronics parallal-printer output, a port for a cassetta recorder, a connection for a bar-code reader, a gataway to tha central bus for applications yet unannounced, and a connector for plug-in ROMs.

That's an impressive array of standard features, but the most significant thing about the Model 100 is probably its battery-powered long-life memory. Forget disk drives; forget cassette recorders, and remember this: up to 32K RAM that can be maintained on board for weeks without a change of batteries or a recharge from an AC line. You could write more than 5,000 words—the equivalent of 20 double-spaced typed pages—and then make your way to tha nearest telephone and transmit your copy to an IBM PC or othar computar for storaga, manipulation, or printing. You could take orders on the road, waiting for weaks until your return to the main office to download files. You could program a 32K BASIC- or assembly-language program, including dot-addrassabla graphics, a full ranga of ASCII characters, and sevaral octaves of sounds, and than transfar tha product to a larger machina.

## A Couple of Tiny Notes

Here are a few vital statistics: The Model 100 weighs in at 3 pounds 13.5 ounces and measures 8¼ by 11⅝ inches by 2 inches deep. (A piece of typing paper is 8½ by 11 inches.) It's actually hard to imagine a portabla computer becoming much smaller without reducing the utility of the kayboard and screen. The basa price for a Model 100 with 8K RAM is $799. A top-limit 32K unit would sell for $1,119.

Powar for tha unit comes from four AA alkaline batteries or an optional 110-volt AC adapter. Tha on-board RAM is kept refreshed by a Ni-Cad battary pack that is recharged from the alkaline batteries or wall current. The alkalines are estimatad to hava a useful life of about 20 hours; a red light indicator on tha front of tha unit warns of low power.

Tha on/off switch on the side of the Model 100 controls only the power to the computar and screen. Power to the RAM is kept on at all timas—Radio Shack says tha Model 100 will maintain 32K RAM memory for about 8 days between power-ons. There is a well-protectad central powar switch on the bottom of tha unit, designad to be turned off if the computar is to be deactivated for a long period of time and for replacement of the rechargeable Ni-Cad power pack about onca evary 30 months. Any copy not backad up on a cassette recordar or other davica is lost when tha master switch is opened.

Tha trick to the Modal 100's battary operation is its dependance upon complamantary metal-oxida semiconductor (CMOS) technology for its microprocessor, ROM, and RAM. These devicas draw considarably less current than ordinary silicon chips. The liquid crystal display (LCD) also requires much lass powar than a video display or a light-amitting dioda (LED) systam. Further, the piezo speaker requires lass powar than an ordinary magnetic speaker. The computer will automatically shut down (saving files first) whan activity stops for 10 minutes.

Undar the hood of the Model 100 is a CMOS 8085 microprocassor (an 8-bit distant cousin to tha 16-bit 8088 brain of tha IBM PC), part of the Intel 8080 family of chips. Tha 8085 runs at 2.4 MHz. Radio Shack's 32K CMOS ROM packs a state-of-the-art sandwich of 32 8K-bit chips into a single integrated circuit. What's more, a compartment on tha bottom of the computer has a 28-pin plug that will accommodata plug-in ROMs, possibly to add functions such as spreadsheets, full-featured word processing, spacialized applications, and gamas. Naxt door is a 40-pin connector that is an extansion of tbe computer's bus. It should not be long befora Radio Shack (or other makers) offar peripherals to plug into tha Model 100.

How about a video-displey card to drive a monitor? A disk-drive adapter?

### Through an LCD, Darkly

Tbe principel drawbeck to the Model *100* is its LCD display screen. The window can show 240 black dots across and 64 dots down, sat ageinst a blue-gray background. As owners of digital LCD watches know, though, it requires just the right amount end angle of light to make tha numbers end charecters visible—ganerally, a strong slightly-angled overbead light. Tbe Modal 100 includes a vernier adjustmant on the sida of the unit to brightan or darken the displey, but you still won't be able to work in e derk room.

Cheracters ere displeyed in e 5 by 7 dot box, eecb standing about one-quarter inch high. The keyboard includes ordinary Escape and Control kays as wall as Grph end Code buttons. The combination of the four special keyboard sbifts and tha ordinary elphanumeric keys allows direct access to ell 256 ASCII cbaractars included in the Model 100's repertoire. Although Radio Shack is not yat offaring such a progrem, it should be easy for developers to come up witb simple grephics progrems end gamas for the Model *100*, perhaps using the plug-in ROM compartment.

One other Shift key on the Model 100, called Num, converts tan cbaractars on tha right side of the keyboard into a calculator ped. I would bave apprecieted some tectile guide for these keys, such as a small reised dot on the *I* key, which subs for the number 5.

Tbe eight function keys are clustered at the top left ebova the keyboard. From the canter to the top right of tha kayboard, there are aight spacial keys: Paste, Label, Print, Break/Pause, end four cursor controls. With the cursor keys, you can move the marker by character or line. You cen elso jump from tha beginning of a file to the end by typing Ctrl and the down arrow, and from the left side of e line to the right side by typing Ctrl and right arrow.

*IT SHOULD NOT be long before Radio Shack (or other makers) offer peripherals to plug into the Model 100.*

Pressing the Label key from within any applications program displays the essignmants of tha function keys on tha screen's aighth line, just ebove number indicators one through eight on the bottom border of the display window—e compromisa that substitutes for heving the function keys directly below the screen.

### Built-in Applications

When you turn on the power, the Model 100 displays the current date, day, and time, and an opaning menu of five applications programs end as many as 18 RAM files. The applications, loaded from the Microsoft ROM chip, are BASIC, TEXT, TELCOM, ADDRSS, and SCHEDL.

To anter directly into the text processor, you move the cursor to Text file and press the Enter key. The menu claars and the display asks for the name of the file to be adited. If you enter e name already stored, the computer will retrieve that file for editing and eddition. If you enter an unfamiliar name, a file will be created. There is a second, very convenient way to enter the text editor for a file elready in storaga: From the opaning menu simply move the cursor to that file's name and press Enter. The program will recognize the ".do" extension to the file name (added eutometically by tha text editor) and enter the eppropriete programming into RAM along with the file.

Within the text editor, seven function keys have been specially assigned:

- F1 is Find, wbicb ellows you to search for a specifiad string (up to 24 characters long) in the text. Tha saarch ignores upper and lowar case end looks only from the top of e file downward. It would be possible to manually perform a search-and-replace function by typing in a correction eech time the characters are located in the file. F1 retains the current string characters until erased with a backspece kay, so it is easy to step through a file quickly.
- F2 and F3 are Load and Save commends for storing files on a cassette recorder or othar external device.
- F5, F6, and F7 are Copy, Cut, and Sel commands, part of the editor's block-and



*Top view of TRS-Model 100.*



*Interior view of TRS-80 100.*

word-manipulation functions.

- F8 axits the text program and returns to the main manu, saving tha file to the battery-maintained RAM automatically.

### Using the Text Editor

The Model 100 text editor remains in an insert mode at all times. You can add copy at any point by moving the cursor to the desired point and typing. Tbe text automatically reforms into paragraphs as copy is added or daletad. (Tell that to the designers of WordStor, someone.)

The Model 100 combines two types of deletion functions in its Del/Bksp key. In ordinary use it is an erasing backspace, removing tha charactar to the left of tha cursor and closing the gap it has opened. It, like all of the othar kays, will automatically rapeat whan bald down, and it is therefore possible to remove entire words or lines hy merely holding the kay down. When tha Del/Bksp key is struck in combination with the Shift key, it will remove the character directly above the cursor and close the gap. Holding down this combination of kays will take out the remainder of a word or sentance to the right of tha cursor.

To manipulata wbole blocks of copy, you first defina the block by using the F7 Select key to Identify the beginning and end. All of the copy selected is shown on the screen in reverse: gray against a black background. Once the copy has heen defined, It can be deleted using the F6 Cut key; moved using the F6 Cut and tha Paste key combination; or duplicated using the F5 Copy and the Paste keys.

This is the sum total of the text-editor program on the Model 100. Not exactly the bells and whistles of a WordStor, but for tha purpose, adequate. A minor problem is that the program does not always line up the left margin of copy on the screen; when reforming a line, a space will sometimes hold at the end of the last word on the lina abova, whicb causes tha space to appear at the beginning of the line below. A more serious drawhack for word processing uses: Only eight lines of forty characters can be seen on the screen at any one time—one-sixth the display of the 24-by-80 IBM PC screen. (Some PC word processors may be a line or two shy of 24 because of status lines.)

*Keefe, Janice J.,:2075551212<= ^C?U1234,567^MPPASSWORD^M>: 8088 Chipwich Blvd., Silicon Mountoin, MI. 56502*

*Figure 1: Exomple of on ADRS.DO listing. Using the Address Organizer, you could seorch for ony element of the doto stored in the file. You could, for example, locote Ms. Keefe by asking the program to find her by nome, oreo code, zip code, or ony part of her oddress.*

Printing a file from within the text editor is very simple. To dump tha antire file to a printer driven by the built-in parallal port, marely typa the Shift and Print kay comhination. To print just the lines appearing on the screen, you bit the Print button. The program will ask for a choice of width, with any number between 40 and 132 acceptable. Although not addressed in the manual, it should be possible to embed some Escape or Control characters in copy to allow underlining, boidfaca, special characters (including graphics), and othar special featuras of the printer. Similarly, a text-formatting pro-

## Love At First Byte?

*The truth must come out (as soon as the hackers disassemble the TRS-80 Model 100 ROM and figure out its file system).*

Once i saw a girl on a bus. She was a knockout. She gave a faint, demure smile in response to my admiring stare, then looked out the window. She must have felt my eyes on her the whole time, for when she got up to leave she flashed an incredihle, devastating grin. I was in love. They say mystery makes romanca. I knew absolutely nothing about her; mayhe that's what did it.

That's how I feel about this new machine from Radio Shack. It's love at first sight, hut there's still so much i don't know ahout it. i feel we bave a graat deal in common, hut I hunger to know all. First, this package is superb, clearly better than the Epson HX-20, its chief competition. Despite Epson's built-in printer and microcassette, the features in the Model 100 are the ones you really need: the text editor, communications, the choice of parallel or serial ports, and the hig beautiful display.

I have all these questions. There's an 8085 in there, hut can I get at the machine language? The manual tantalizas me by talking about BASIC's ability to call machine-language subroutines and hints at a provision for a .CO (COmmand?) file type in addition to the .BA and .DO file types that cover BASIC programs and document files. There is a provision for uploading and downloading files through the modem and RS232 ports, hut is there a simple way to redirect the output from BASIC to the RS232 port instead of the Centronics port?

*THE RADIO SHACK Model 100 may give up its secrets grudgingly, but I mean to know everything.*

Who are Hayashi and Rick and Suzuki, and why are their names embedded in tha ROM? What will be the function of the CRT and DSK input and output commands huried in BASIC's repertoire? I found that I could clear the screen with a formfeed (CHR$(12)), but is there an escape sequenca or other provision for direct cursor addressing? This may not seem like a hurning question to you, hut in addition to its duty as the ultimate PC accessory I'd like to use the Model 100 as a data terminal for a UNIX system. UNIX will respect all of the cursor-control and screen-management functions if you tell it what they are. Similarly, how do I access the reverse-video function?

Although Radio Shack is justifiahly proud of its stacked-chip memory technology, it's a minor irritant to me. You can't huy a hase-line machine and add

gram could be written to add headers, footers, and page numbering.

For this review, the Model 100 was used to drive two printers: A Gemini 10 dot matrix and the Smith-Corona TP-I daisy wheel. The Smith-Corona performed flawlessly, genereting a professional-looking business letter from the Model 100 output. The Gemini required some adjustment of the DIP switches to add proper line feeds.

### Meeting the Schedule

The *Schedule Organizer* program is a mini-database to locate names, addresses, phone numbers, and other bits of information. Tbe file is maintained in a special text file that must be named NOTE.DO. Three function keys are enabled under this program: F1 to "find" a particular item in the file and display it on the screen, F5 to find an item and send it to an atteched printer, and F8 to seve and axit the program to the main menu. The command keys, Peste, Label, Print, and Break, perform the same functions in all application programs.

NOTE.DO can be edited or updated from within the text editor. One possible use for the program would be to maintain a running expense-account tally during a business trip. This is when the Model 100 is most likely to be used, anyway.

The Address Orgonizer performs a similar role, using identical commands end function kays in e file that must be nemed ADRS.DO (see Figure 1). fts purpose is to meintain a telephone directory that can be used for automatic dieling using the computer's built-in modem. Any string of numbers anclosed within colons signals the presence of a telephona number to the program. Adding a <> combination after the number signals tha telecommunications program to switch from entry to terminel mode after a link has been establishad. The program also allows you to add a log-on sequence between the engle breckets for use in establishing links to networks like CompuServe and The Source.

***THE SCHEDULE Organizer program is a mini-database to locate names, addresses, phone numbers, and other bits of information.***

### Micro Telecommunicating

The Telecommunications Program (TELCOM) is divided into two modes: Entry and Terminal. The entry segment allows you to set the built-in direct-connection modam's communications parameters and the pulse-dialing of e telephone number entered from the keyboard or selected from the ADRS.DO file.

The Model 100 includes an answar/originete switch. The defeult communications sattings for the internal modam are:

Baud rate: 300
Word length: 7-bit
Parity: Ignore
Stop bit: 1
Status: XON enabled
Dial pulse rete: 10pps

your own (cheap) memory as you can with the TRS-80 Model 1. Tbis is greet for Radio Shack, bad for budget-minded consumers. They are also playing the technical dateils of the machine pretty close to the chest. Fortunetely for the aftermerket, there ere probably more down-and-dirty 8080/8085/Z80 heckers out there than there ere for ell the other chips put togeth-er. By the time you read this, one or more of them will heva disassembled the entire ROM and figured out the fila system end everything else inside. When this heppens, you'll see a couple of "Secrets Reveeled" paperbecks end maybe a user group or two spring up around the machine. Independent suppliers wiil provide herdware, software, and firmware enhancements. Competitors will move into the market and prices will fall. Machines with less than 32K RAM will diseppear from view.

Is this machine a true breekthrough? Yes and no. It was built with off-the-sheif components with the exception of the stacked memory chips. Granted, tha components are state-of-the-art, particularly tbe 40 column by 8 line displey. Meny of the chips used inside are new on the market, given Radio Shack's desire to build the entire machine with CMOS chips. i guessed (and confirmed with sources et Radio Shack) that the reason the company used a CMOS version of the 8085 (80C85) instead of a CMOS Z80 is that currently, only one source produces e Z80, while several produce CMOS 8085s.

***COMPETITORS will move into the market and prices will fall.***

As impressed as i was with tha Modal 100's power, i couldn't belp but feel that it could have been haif as thick and half as heevy. To see why, take e look at the calculetor industry. Inside the Model 100 ere three fibergiass circuit boards: the mein computer board, the keyboard, and a board thet backs up the LCD displey. If weight and size ware more important design criterie, all of them would be replaced by the peper-thin-flexible circuit board technology found in today's calculators and cameres. The Model 100 conteins many analog circuits, end enalog circuits mean resistors and other bulky components. Thesa bulky elements could easily be replacad by thick-film custom circuits or custom hybrid enalog and digital integrated circuits.

Although I am a strong edvocete of full-travel keyboards, it is possible to build e machine like this with e membrane keyboard or e short-travel keyboerd with tectila feedback end e hinge in the case. The kayboard couid then foid over the display, and your portable computer would be the size of a Michelin Guide. As I write this, the machine I am describing is probably on somone's drawing board. If it isn't, the idea is free, get to work!

Unlike the sean-once and gone-forever girl on tha bus, the Radio Shack Modal 100 is here to stay. It may give up its secrets grudgingly, but f meen to know everything. Our relationship will be all the better for it. —*Bill Machrone*

The program ellows word length to be changed to 6 or 8 bits; parity to be set to odd, even, or none; stop bit reset as 2; XOFF enabled; and pulse rete doubled to 20pps. The baud rate for the built-in modem is fixed et 300 baud. However, there are nine other retes ranging from 75 baud to 19,200 baud that can be specified. Selecting one of these rates eutometically shuts off the internal modem and activetes the Model 100 RS-232C output port for connection to e stand-elone modem.

The telephone connecting cable provided with the Model 100 is designed to work with modular phone plugs. If these are not evaileble in your home or office (or in a motel or telephone booth), Radio Sheck sells e lightweight set of rubber cups thet ettach over the receiver and transmitter of e standard telephone handset to form an ecoustic modem.

From the entry mode, typing the F1 function key allows you to Find a telephone number stored in the ADRS.DO file. To call the number, type F2. The name of the person being called end the phone number will appear on the screen es the Model 100 dials. The computer must next switch to the terminal mode, either autometically on the basis of the entry in the eddress listing, or manually, through use of the function key F4. Operetions in the terminel mode depend upon the nature of the software at the other end of the line. For most programs, however, the function keys control uploading (transmission of files) and downloading (retrieval of files).

We tested the Model 100 by sending a file of several peges from the PC Magazine offices on one side of Manhettan to the eutomatic bulletin-board system of one of the editors on the other side of the islend. The editor's IBM PC-XT successfully answered the Model 100's call and estebIished e link using Crosstalk software. It was possible to read e directory of the hard disk et the answering stetion, and we successfully transmitted our file from the Model 100 and stored it in the PC-XT. Then, working on the IBM mechine, we read the deta as a nondocument file into *WordStar* and edited it. The only problem we experienced wes that the Model 100 transmitted extraneous coding et the end of eech line, and the *WordStar* file could not be eutomatically reformetted. It was necessary to remove manuelly the coding (*WordStar*'s search-and-replece function would not solve the problem) and reform the paregrephs. However, other word processors might be able to handle the coding sent by the Model 100, or e simple program could be written to strip the file of bothersome signals. In any case, the transmission of information was successful.

*WITHIN THE text editor, seven function keys have been specially assigned.*

Included in the peckage with the Model 100 is e password pecket: e CompuServe manuel with e pessword worth one hour of free off-peak time. A manual for the Dow Jones News Service is also packed in the box.

## A Bit of BASIC

The Microsoft BASIC offered by the Model 100 is elmost identical to the IBM PC languege (elso developed by Microsoft), and as such, slightly different from TRS-80 BASIC used in other Radio Shack microcomputers. One thing very different—end to some users a great improvement—is e full program editor. Just type Edit from within BASIC end the screen cleers and then displeys a iisting of your program within the text editor. You can move the cursor to any line to make chenges or use the Search commend to go to specific variables or values. The editor's Cut, Peste, end Copy commands are elso available. Typing the F8 key exits the editor end re-enters BASIC with your corrected program elreedy saved to RAM.

The LCD screen can be eccessed on e pixel-by-pixel basis using Pset and Preset statements. Also within control are the RS-232C port, the function keys, the parellel-printer port, the bar code reeder, the cassette port, and other devices. Additions to "ordinary" BASIC include interrupt instructions that can check the onboard clock, the communications port, and error conditions.

Model 100 BASIC also allows en override to the micro's automatic power shutdown efter 10 minutes of inectivity. The ebility to leeve the power on would be necessary if you want to leave the Model 100 as an unattended answer-only terminal. Files can be merged, deleted, or renamed, but there is no provision for autometic line numbering or renumbering of lines.

*THE TELEPHONE connecting cable provided with the Model 100 is designed to work with modular phone plugs.*

## Stepping Up to the Bar

Radio Sheck does not yet offer e bar code reeder for the Model 100, elthough there is a port for such a device on the side of the unit. The plug is reportedly compatible with several existing wands. This capebility could move the Model 100 into many exciting new areas. The Model 100 could go into the stock room or the leboratory for inventory and deta collection. And, the Model 100 could reed new programs for inexpensive bar code printouts, once again stepping around disk drives, ROM cartridges, end tepes.

One note, without comment: The Model 100 does not come from the Americen fectories of the Tandy Corporation, Radio Shack's parent company. Insteed, it is reportedly menufectured by Kyoto Ceremics Co. of Jepan, a company responsible for en NEC porteble introduced in Japen earlier this year.

## A Micro-Review

The Model 100 is an ingenious, capeble device, truly worthy of the neme microcomputer. It offers an exciting example of the new weve of portable computers. It would be even nicer were it based on the PC's 8088 microprocessor. Do I hear the sound of circuit boards etching somewhere?

Elsewhere in this issue is e review of the PC-competible Compeq "porteble" computer ("Compaq: Heve Computer, Will Travel"). Thet device offers some very impressive capabilities, but consider this: On a recent trip, the Compeq sat sleeping up top in the luggage compartment while the Model 100 earned its keep on the seatback dinner tray. */PC*

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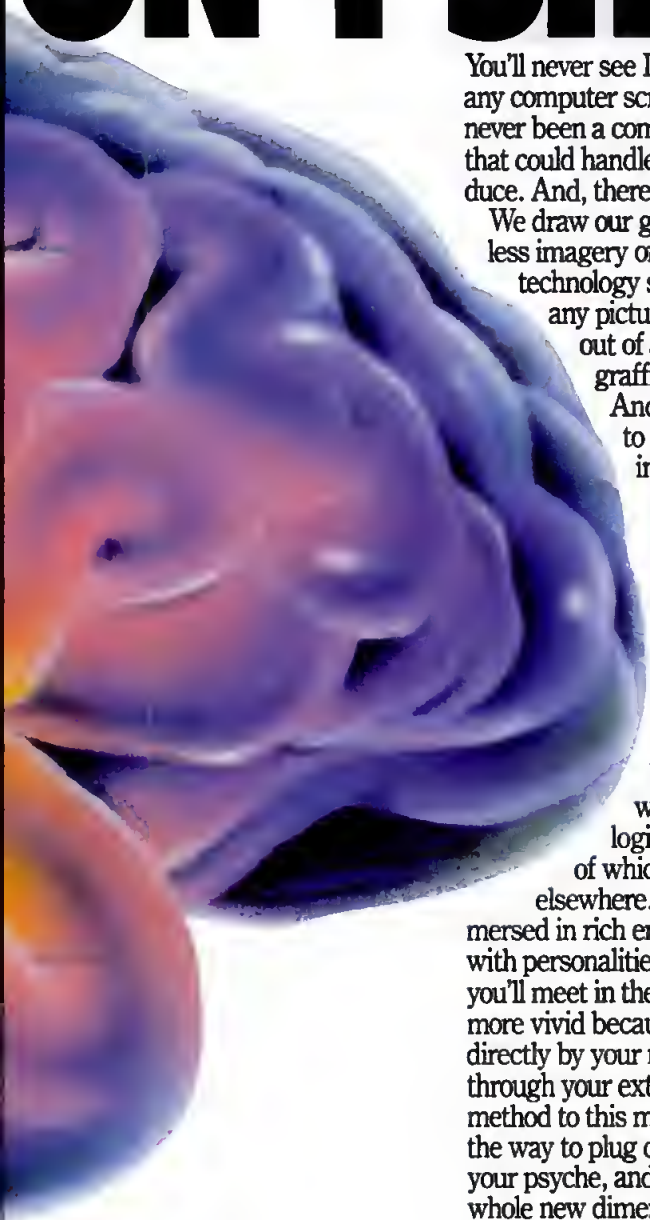
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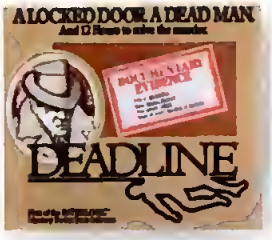
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**CIRCLE 260 ON READER SERVICE CARD**

SOFTWARE/COREY SANDLER

*The commands are intimidating at first, but if you tough it out, you'll discover a resolute graphics program that supports a horde of printers and plotters.*

# Business Graphics' Business Graphics

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(617) 491-3377
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CIRCLE 602 ON READER SERVICE CARD

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Hewlett Packard
HP7225, HP7220, HP7221, HP7470
IBM XY/750
Sweet-P 100

**Letter-quality printers supported:**
Qume Sprint 5
Diablo 630, 1610, 1620, 1630, 1640, 1641, 1650
Xerox 1710, 1720, 1730, 1740, 1741, 1750

**Dot-Matrix printers supported:**
Anadex DP9000, DP9001, DP9500, DP9501
NEC 3510, 3550
Other Qume and NEC printers with protocols compatible with these choices.
IBM Matrix Printer with Epson Graftrax ROM, IBM Graphics Printer
Centronics 122, 352, 353
Epson MX80, MX80 Graftrax, MX100
C. Itoh Prowriter 1550, 8510A
Watanabe WX4633, WX4634, WX4635, WX4636, WX4637, WX4638, WX4671, WX4672, WX4675
Amdek DXY-100
Strobe
Integral Data Systems 440G, 445G, 460G, 560G, PRISM
Okidata ML82A, ML83A, ML84A

*Figure 1: A list of printers and plotters supported by BPS.*

*BPS Business Graphics* puts on a truly beautiful face. But like most beautiful people and objects, *BPS* is much more complex than a quick glance might indicate. This program is in effect a word processor for business graphics: It will do it all, but it takes time to get beyond the basics.

*BPS* produces dozens of varieties of bar charts, pie charts, line graphs, and combinations. The output can be in monochrome or in multiple colors. The product can be viewed on a monochrome or color monitor or television. Hard copy printouts can be made on any of several dozen popular plotters, dot matrix printers, and let-

*THERE IS no provision for operating BPS with a hard disk.*

ter-quality printers (see Figure 1). You can perform mathematical calculations, and draw logarithmic, parabolic, sine, constant, or line curvas. Your bar graphs can be horizontal or vertical, side-by-side or stacked, multi-colored or monochrome, filled or unfilled. You can set saveral lines of titles, add floating lagends wherever you like, insert special marks, end label eny alament. You can evan link together sets of pre-defined pictures in a timed "slide show." Get the picture?

### The Bare Necessities

The manufacturer recommends a PC system with a minimum of 128K of RAM and two double-sided 320K disk drivas. It would be possible to run the program on two single-sided 160K drives with some loss of flexibility for choice of printers and plotters. Thare is no provision for operating *BPS* with a hard disk. Two disks are provided: one, a copy-protected UCSD Pascal program disk, and the second an unprotected damonstration data disk that also contains severel utilities.

The ultimate IBM PC systam for *BPS* would includa both a monochrome display edapter and monitor, and e coior/graphics adapter and RGB monitor. With such a system, you could enter your commands and deta on the monochrome screen and view graphs in color: tha program automatically switches between the two adapters as needed. If you heve only the color/graphics adapter, the text will be cleared from the screen but kept in memory when you call for the drawing of a greph. You can anter commands end data with e monochrome-only system, but the grephics output would have to be directed to a printer or plotter.

For this review, the program was tested on an IBM PC with 320K RAM, two double-sided disk drivas, color/grephics and monochrome displays, a NEC 3550 letter-quelity printer, a Hewlett Packard 7470 plotter, and an Epson MX-80 dot matrix printer with Graftrax.

The program manual is en impressiva, padded 3-ring binder of about 420 pages. Tha paga count is an estimata because some pages are not numbered, probably due to post-publication insarts of new output davices and features. Also included is a 17 by 22-inch wall refarenca chart of soma of the commands of tha program; to the uninitiated it looks lika e map of the London Underground.

The manual itself is well-written and ettractively designed, with plentiful examples of input and output. Unfortunetely, the book falls down seriously in its organization. Concepts and commands are presentad sequentialiy from the most simple to the most difficult. However, there is very little pulling togather of structure in the advanced sections. When I wantad to draw e complex multiple bar graph, I had to refer back and forth from section to section to come up with the appropriate set of commands. The manual would be improved by recapitulations of principal commands for each type of graph. Some of these are available through an on-screen help system, but as delivered, *BPS* is e difficult program to learn.

*BPS CAN do most anything you'd like to do in the area of graphics, provided you can figure out the proper sequence of commands.*

### Starting from Scratch

Commends in the program follow the general form of Verb Modifier Noun Argument(s), as in Set Vertical Range 0 100.

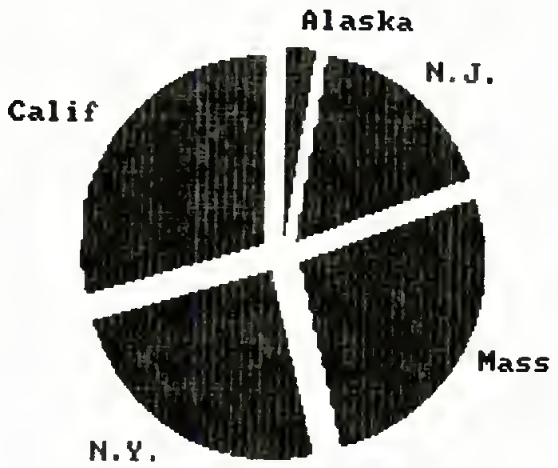



*Figure 2: A simple pie chort drawn on on Epson MX-80 with Graftrax.*

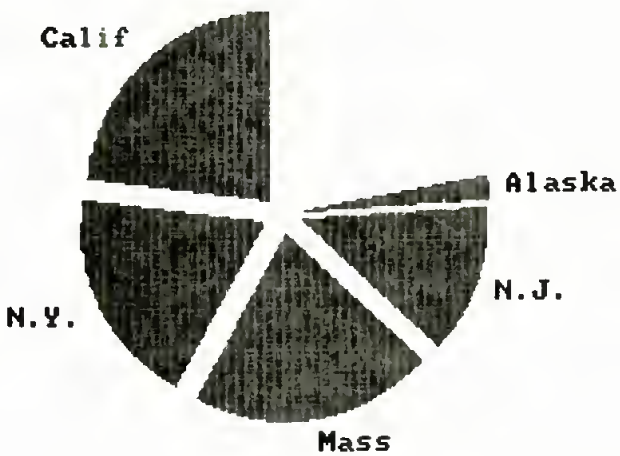



*Figure 3: The same data, this time with the pie indicating a gop of 22 percent, drawn an an Epsan dot matrix printer.*

Many of the commands can be abbreviated; the program will alert you if you enter an ebbrevietion that is not uniqua. For example, SE VE RA 0 100 is en acceptable short form.

*AS DELIVERED, BPS is a difficult program to learn.*

When you load *BPS* you enter into a blank screen with a ---> prompt. The computer knows nothing about your plans for use of a display, e printer or plotter. Depending upon the type of monitor you are using (the manuai calls them "consoles"), you can choose one of three modes: high-resolution bleck and white, low-resolution black end white, and color. The color mode can further be subdivided into RGB or TV outputs. The command can be refinad another step by selecting e foreground palette (green-rad-yellow or cyan-magenta-white) and one of 16 background colors. For example, to select e beckground color of blue with tha foreground color set of cyan, megenta, end white, the commend would be:

SET DEVICE CONSOLE COLOR 101

A "set" devica in *BPS* is an output unit that directly executas graphics. In addition to monitors, "output unit" can Include plottars and some letter quelity printers. "Write" devices produce grephics by trensferring the bit-mep in graphics memory from the console to peper. Dot matrix printars and some letter-quelity printers fall into this category.

## Charting a Course

The graphics program resides in the A drive, while a p-Systam formatted data disk is installed in tha B driva. A formatting utility is provided in the BPS package. Tha date disk is essumed to heve the volume name of DATA unless the defeult is changed. The data disk can include sevaral typas of files: a listing of "points" of data for charts, e set of codes to reproduca a completed chart without specific reference to the points usad In drawing it, end e "take" file. The take fila is an aquivalant of the PC-DOS AUTOEXEC.BAT file, and ellows you to string together e set of commands. Tha take file can serva as a lifasaver from the complexity of BPS commends by allowing you to create—one time only—e series of shells of common functions that can be customized as needed.

I found that the sample dete and take files included with the program provided e comparatively easy way to learn the system. Just as many usars laarn how to program in BASIC by reeding a program listing, I finally began to understend BPS when I listed e few take files.

## A Slice of Sample Pie

Here are the commands, stap by step, for displeying a pie chart—perhaps the simplest of the availebla charts in this program—on e color monitor.

- SET DEVICE CONSOLE RGB 101 (Talls the program to send output to an RGB color monitor.)
- SET DEFAULT VOLUME PC TEST (Instructs the progrem to load or save from e dete disk called PCTEST thet will be loaded in drive B.)
- EDIT (Enters the editing mode.)

When you enter the Edit commend, you enter lebels and numbars in pairs saparated by e spece or e punctuation mark. For exemple, you could enter five pie segments es follows:

```
Calif 23
N.Y. 19
Mass 21
N.J. 13
Alaska 2
END
```

To draw an untitled pia chart from this information, all that would be needed would be the commend DRAW PIE. The result, on the color monitor, would be e pie with five segments representing portions of the whole of 78. Tha colors would step through the three selections in our paletta, in this case cyan, magente, white, cyan, end magente egeinst a blua background. Tha name of each slice would be printed outsida of the pia segments. See Figure 2 for an example of this pie chart drawn on an Epson MX-80 dot matrix printer with Graftrex.

Suppose thet you wanted to add one

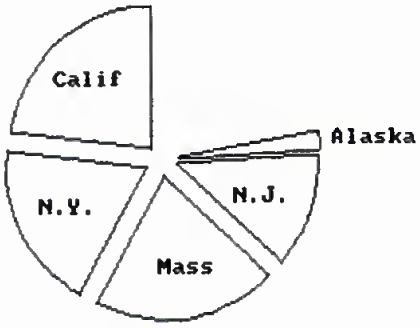



*Figure 4: Instructing BPS to SET FILL OFF results in outlined pie wedges (or bor elements) with lobels outomoticolly ploced inside where possible.*

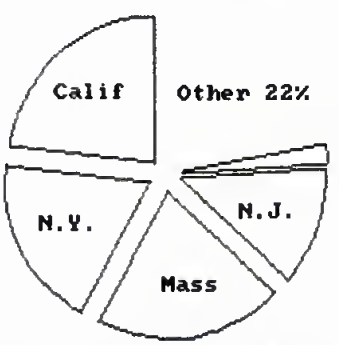



*Figure 5: In this chort, the flooting title, "Other 22%" hos been odded, olong with o general title.*

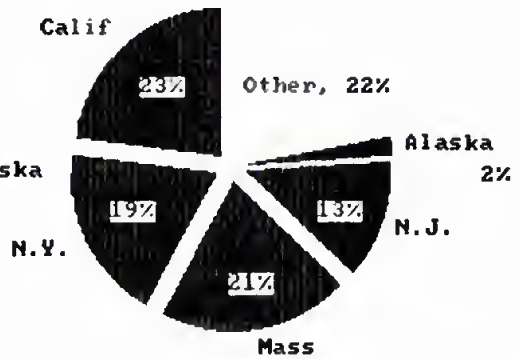



*Figure 6: Switching back to FILL ON, this version of the some chart includes flooting percentoge figures set into pie wedges (except for the Aloska slice, which is too norrow to occept the percentage figure).*

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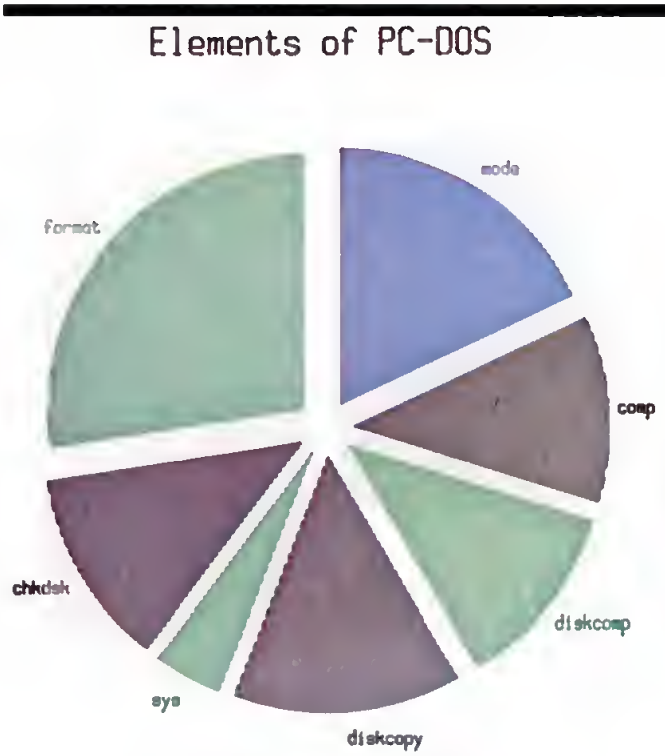



*Figure 7: A three-color filled pie chart produced by the BPS program on a Hewlett Packard 7470A plotter.*




*Figure 8: The same pie chart, this time plotted with the Fill option turned off.*

more slice representing the rest of the states. The correct command is DRAW PIE 0 100. This tells the program to scale the pie to represent 100 percent of the total (see Figure 3). The program will proceed to generate a sixth wedge, representing the required 22 percent.

Another command, SET FILL OFF results in pie segments that are outlined but unfilled. When you select this option, the program automatically inserts the names of variables inside the pie segments (see Figure 4). SET FILL ON returns to the default condition.

### Adding Titles to the Pie

BPS allows addition of titles to the top and bottom of most charts, to the horizontal and vertical axes of bar and line graphs, and anywhere else on a chart through use of a "floating title." SET TITLE "PC OWNERS" will put a general title at the top of the pie. The floating title command is SET HORIZONTAL FLOATING TITLE "Other 22%". When you call for a floating title (horizontal or vertical), a rectangular box of the same length as your title appears in the center of the screen. You can then position this box where you want the title to appear—in this case, in the unfilled pie segment—by using the cursor arrow keys and then striking Return when the box is in the proper place (see Figure 5).

If you draw the pie with Fill turned on, you will generate solid slices of pie with the names of states set outside the circle. To insert a percentage inside the pie, you instruct the program to set percentage titles in the background color, in this case blue: SET COLOR BACKGROUND. Next,

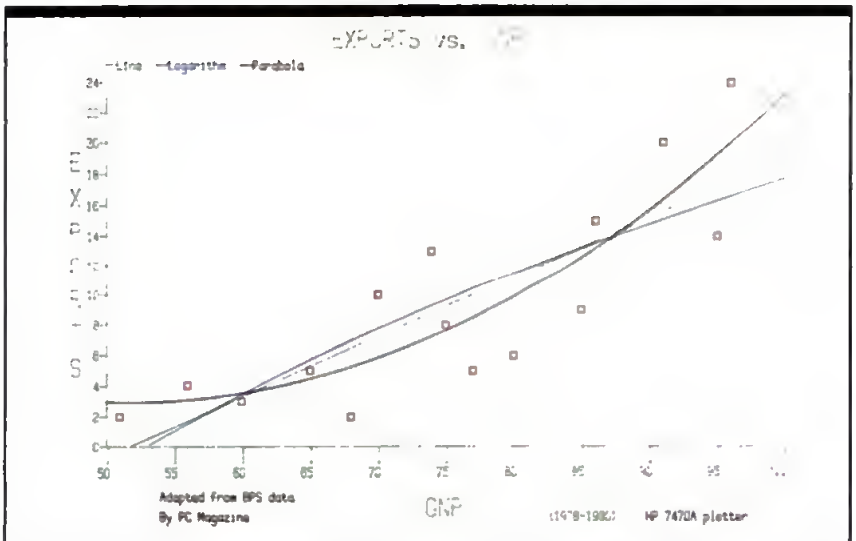



*Figure 9: A complex line graph, showing straight lines, and logorithmic and parabolic curves, with a scatterplot included. Produced on the Hewlett-Packard 7470A plotter.*

you call for and position these percentage figures for four (in this case) of the five pie slices. The wedge for Alaska is too narrow to permit insertion of a percentage figure within the slice (see Figure 6). The pie chart completed, you can save the work in the form of points or a completed graph.

### Drawing the Line

Here is an example of a more complex line graph, displeying both en ordinary point-to-point line and a smooth moving average line. Using an Edit command, data for each of 31 deys of e month—the example is August—are entered, as in:

```
1 425
2 401
3 475
4 424
x
x
x
30 641
31 697
END
```

The titles are created:

```
SET TITLE ''CAR AND DISK DRIVER
MAGAZINE''
SET HORIZONTAL TITLE ''August,
1983''
SET VERTICAL TITLE ''Subscrip-
tions sold''
```

Since we are going to be drawing a line chart with two lines, it would help to be able to identify which line is which. We can do this with a "legend." We must instruct the program to set aside space for two such legends:

```
SET LEGEND SPACE 2.
```

Now we are ready to draw the first line, using the simple command DRAW LINE. If we follow this immediately with the command, SET LEGEND TITLE "L = ACTUAL" 1 the program will draw, in the same color used for the line, a legend thet indicates that a solid line (L) stands for ACTUAL subscriptions received.

Next we want to show a lIne that depicts the subscription sales trend, e "smooth moving average." The program will smooth out the jegged up end down points of the data. The general form of that command is SMOOTH MOVING AVERAGE <past points> <future points>. What you are being called upon to provide is a range over which to determine the average (arithmetic mean) of the data.

For example, SMOOTH MOVING AVERAGE 3 2 would instruct the program to take the first five data points and compute the average. It would then assign that average to the first point listed as the <future points> argument, in this case, the fourth deta point. Next, the program would average the next five data points and assign that value to the fifth point, and so on. The computations continue until the program can no longer find five points to average. (An alternate form of the smooth moving average is the smooth exponential line, in which the avereges are more heavily weighted toward the recent past.)

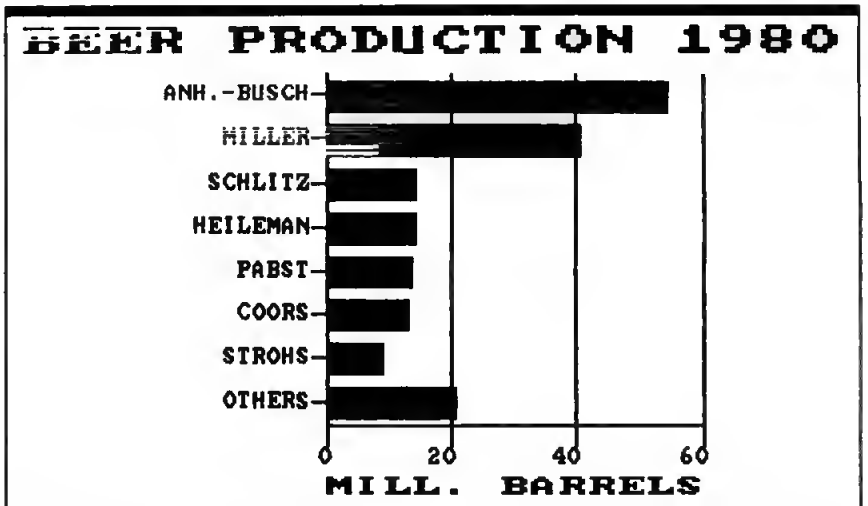



*Figure 10: A nat-very-successful exomple of o BPS bar chort produced on o NEC 3550 letter quolity doisy wheel printer. The art is made up on thousands af individual dats punched by the printer in a process thot can take more than 10 minutes far a single chort.*

In order to differentiate this smooth moving everage from the ordinary line, we instruct the program to DRAW DASH. The dash is one of five styles of lines that can be drewn using the *BPS* program.

Finally, we call on the program to SET LEGEND TITLE "D = MOVING AVERAGE" 2. This places, in legend spece 2, an indication that the dashed line represents an average.

### Now, the Hard Work

All of this work has been reproduced on a color RGB monitor. In order to make a hard copy printout of any of the charts, it is necessary to configure the program to your hardware. *BPS* includes about a dozen protocols among the utilities on the data disk, covering most common devices. The manual includes step-by-step instructions for configuring other devices, including information on setting DIP switches on printers and plotters if necessary.

There are two steps to output. First, you must inform the program that output will no longer go to the console. The form for this instruction is SET OUTPUT UNIT REMOUT for "remote output," the required command for ectiveting the serial (asynchronous) port used by plotters and some printers. For transmission of information via the parallel port, the command is SET OUTPUT UNIT PRINTER.

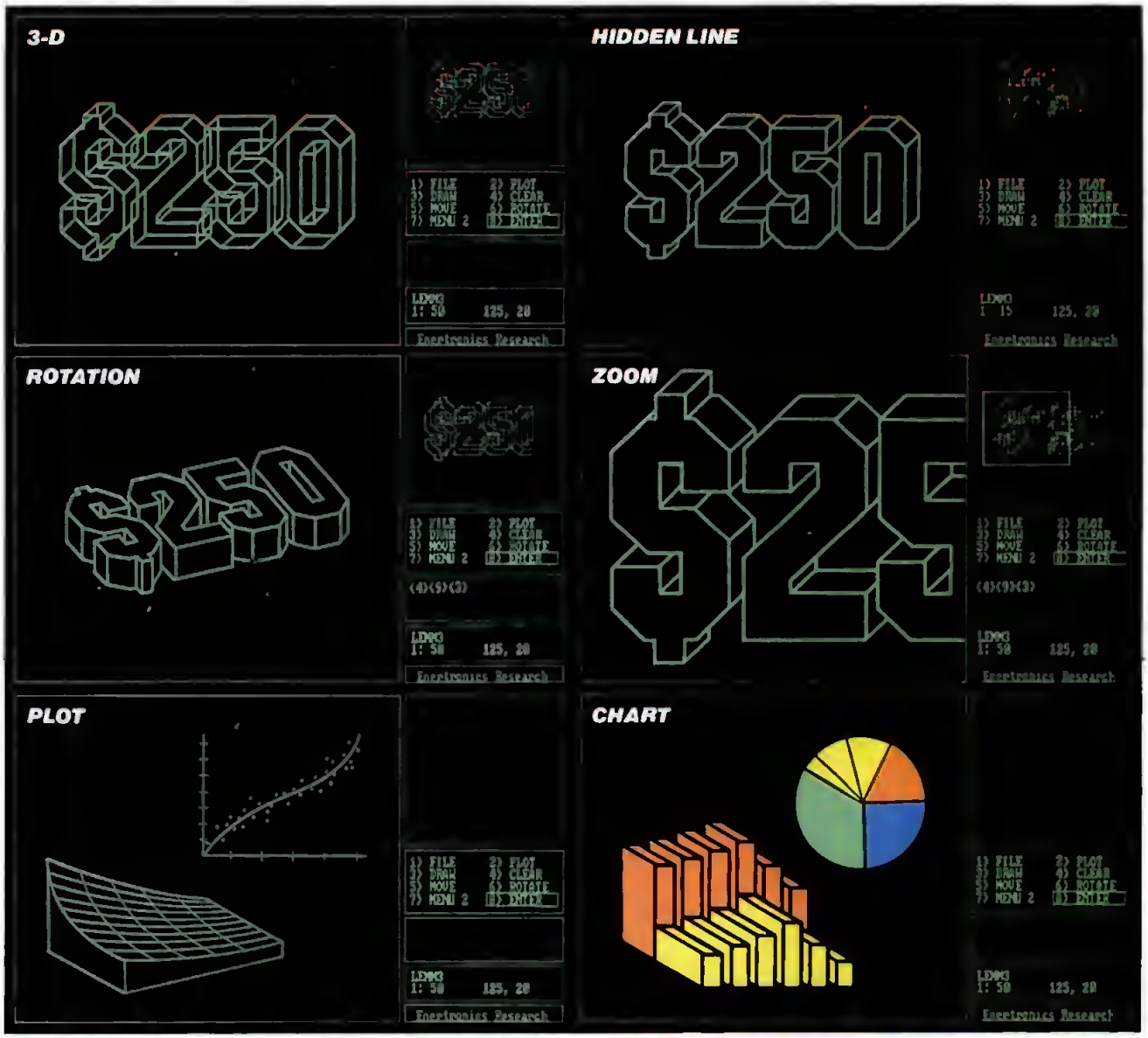
The next step is to identify to the program the specific unit to be used, as in SET DEVICE HP7470 0 2, telling the program to use handshaking (0), and two different pens with a Hewlett Peckard HP7470 plotter. Using a "write" device such as the Epson MX80 requires the command WRITE SCREEN MX80GRAFTRAX.

### What Does It All Mean?

If all of this sounds confusing, it's because it is confusing. *BPS* can do most anything you'd like to do in the area of grephics (see Figures 7 through 10), provided you can figure out the proper sequence of commends. I kept thinking of my first few sessions with a word processor: I learned to use thet, too, after days of gneshed teeth end strained eyes.

Don't look et this program if all you want to do is make pretty pie charts. That would be like buying an ocean liner for cruises on the mill pond. But if your needs are complex, this complex and capable program is for you. */PC*

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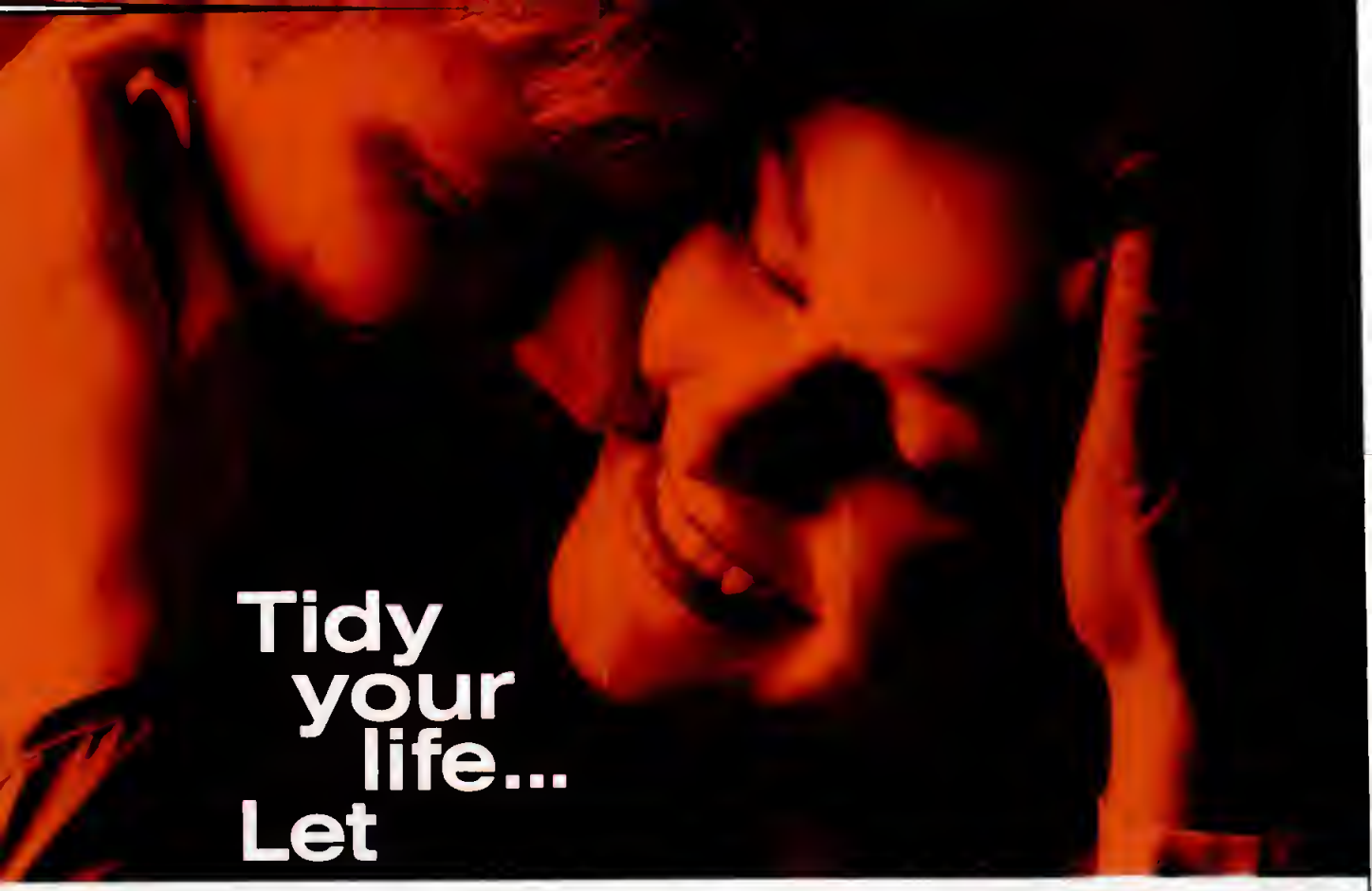
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This review will describe three drawing programs for the IBM PC: *Glyphix* from Starside Engineering, *PCcrayon* from PCsoftware, and *PC-Draw* from Micrografx. These three programs vary in prica from $24.95 to $250. Thay are, however, similer in concept and performance. They all can cater to the needs of groups of users as diverse as draftsmen, businessmen, designers, and doodlers.

The concept behind these drawing programs is simpla: they replace tha drafting table and drawing tools with a video screen and computer keyboard. The arrow keys move tha cursor like the tip of a pancil; the backspace key becomes an eraser. The system's RAM holds the equivelent of the templates, the T-square, and triangles. You move the cursor around the screen with tha arrow keys or with commands specifying screen coordinates. The program draws a line wherevar you designate a point. Each of tha programs has cartain built-in shapes that can be called up from the commend menus end manipuleted as desired. Tha number and kinds of shapes and the degree of manipulation vary among the programs.

The real advantage of thasa programs is thair ability to produca varsions of an initial drawing with mejor or minor changes and to keep all of the versions ready for fast reproduction. This ability allows you to easily updata engineering drawings, produce various drawings from "what-if?" analysis, and rapidly modify and generate corporete organization charts. If you ara going to make a drawing only onca, it will probably be easier and faster to do it with a pencil and paper, but if you expect to make a revision with even one change, the computerized drawing system will save you time.

Tha two programs thet use color displays—*Glyphix* and *PCcrayon*—are lim-




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ited to the color palettes used by the IBM color-graphics adapter. The adapter offers two different palettes of three colors each. This setup provides little flexibility. When you change to the other palette, you immediately change the colors of all of the figures on the screen, so certain pairs of colors (such as green and cyan, red and magenta, and brown and white) cannot be on the screen at the same time.

Your choice of color palette will depend on the background color you use (15 are available), the work you are doing, and the color response of your monitor (for example, many monitors do a poor job of reproducing brown). Both Glyphix and PCcrayon allow you to change the palette and background colors with a single keystroke for each operation.

### Glyphix

The name Glyphix is derived from the term "glyphs," meaning the figures used in hieroglyphic scripts. The choice of this name sets the tone for the program and its manual. Glyphix is a useful and some-

## Product Information

*The following programs are mentioned in this article. Please contact the manufacturers for additional information.*

PCcrayon
4155 Cleveland Ave.
San Diego, CA 92103
(619) 279-2482
**List Price:** $44.95
**Requires:** 64K, BASICA, color/graphics adapter, color or non-IBM monochrome monitor.

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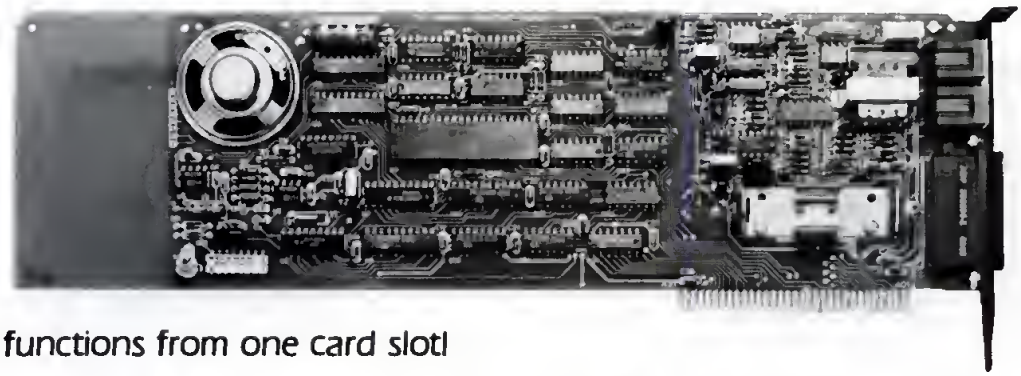
Glyphix and Frieze
Starside Engineering
P.O. Box 18306
Rochester, NY 14618
(716) 461-1027
**List Price:** Glyphix $24.95, Frieze $55
**Requires:** 64K, BASICA, color/graphics adapter, color or non-IBM monochrome monitor.

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PC-Draw
Micrografx
8526 Vista View Drive
Dallas, TX 75243
(214) 343-4338
**List Price:** $250
**Requires:** 128K, two disk drives, color/graphics adapter, non-IBM monochrome monitor, (light pen optional).

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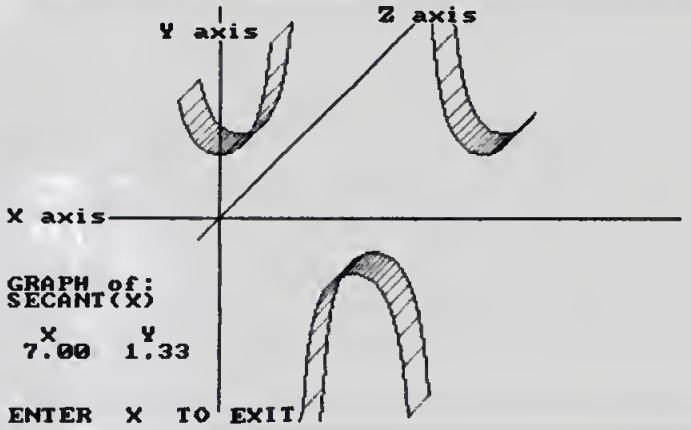
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*Figure 1: These curves were created by Glyphix using a BASICA program. The resulting screens were saved as disk files, then were printed on an IDS Prism color printer using the Frieze program.*





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***THE CONCEPT behind these drawing programs is simple: they replace the drafting table and drawing tools with a video screen and computer keyboard.***

times even playful graphics scratchpad. It can be used for serious image creation as well as for sketching and doodling. The best news is that Glyphix sells for $24.95. You'd need a separate $55 program called *Frieze* to print out what Glyphix creates, but, with only the relatively inexpensive *Glyphix* package on hand, you can create, display, and save diagrams.

*Glyphix* provides you with a clean screen to draw on. At the start, a single pixel flashes off and on in the upper left corner. You can move it around the screen by pressing the cursor positioning keys on the keypad. The 4, 8, 6, and 2 keys, labeled with arrows as well, move the cursor left, up, right, and down; the 1, 7, 9, and 3 keys move the cursor diagonally. Moving in these eight directions creates lines with the same angles used in isometric projection drawings. I had a great deal of fun trying to create diagrams with top view, right side, and isometric projections—the kinds of drawings that used to frustrate me so when I was in high school. I didn't miss my T-square and triangles a bit—I found

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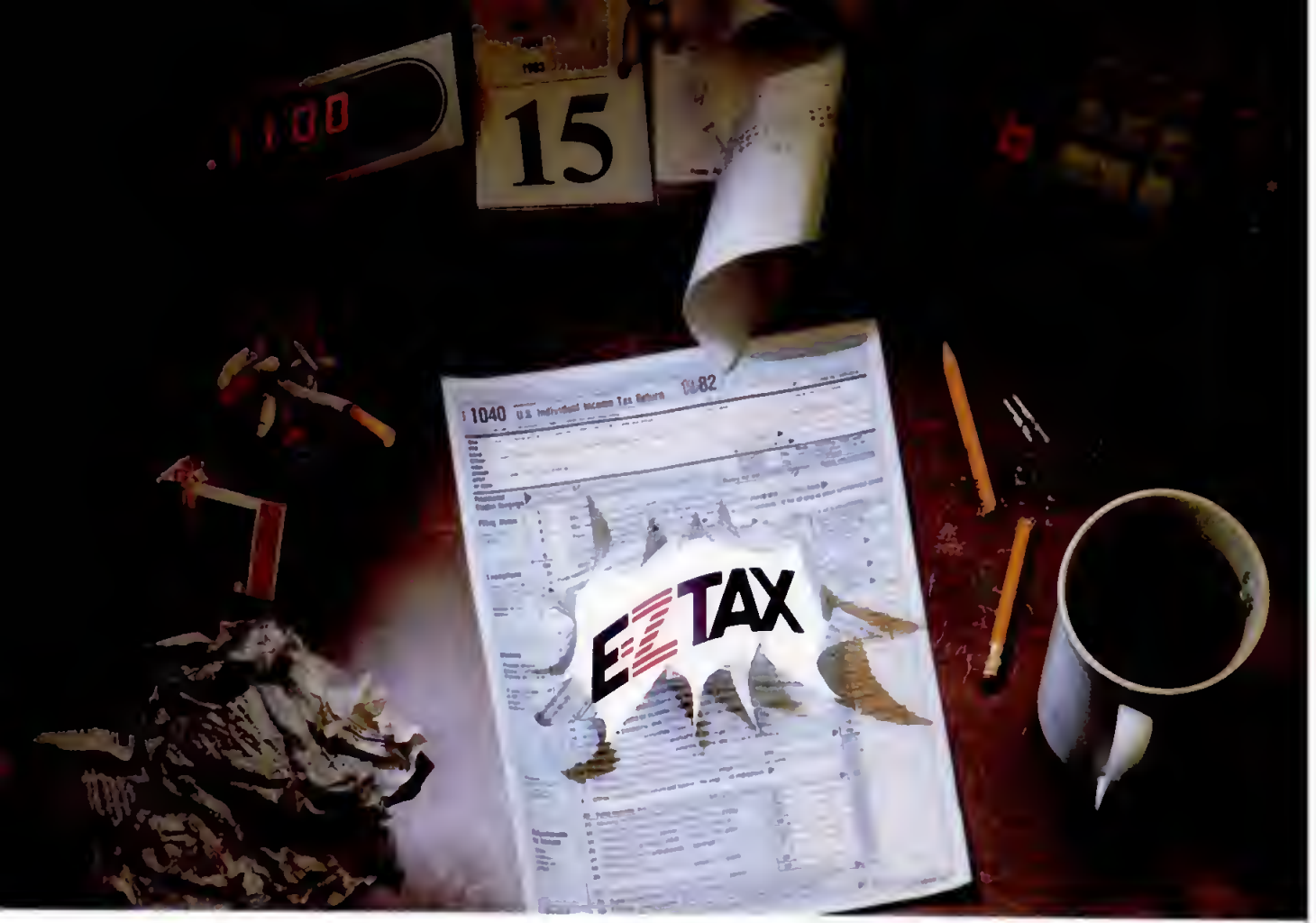
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| Sch. D | 3903 |
| Sch. E | 4137 |
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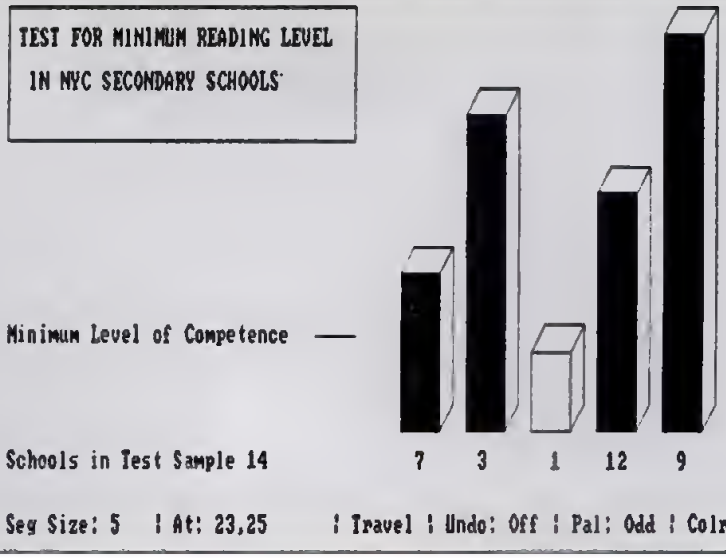
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*Figure 2: This complete dump of a Glyphix screen includes the command line and a bar chart constructed with graphics characters and lettered titles. In the command line, the "Segment Size" area shows the number of pixels (from 1 to 50) the cursor travels on each movement. "At" shows the cursor location. "Travel" indicates the state of the cursor; it is not drawing a line or printing. "Undo" is a special Glyphix feature (here turned off) that saves the screen image to disk before executing a major command. This feature allows you to undo any changes by calling the old image back in. The "Pal" and "Color" items select one of the two pallets and one of that pallet's three colors provided by the PC's color graphics board.*




***IF YOU ARE going to make a drawing only once, it will probably be easier and faster to do it with a pencil and paper.***

the job much easier.

When you start using Glyphix, the cursor is programmed to move one pixel at a time. This mode allows very precise drawings, but it slows the progress of the cursor across the screen. You can press the Z key followed by e number from 1 to 50 to increase the number of pixels used in each move. You can also mova the cursor quickly by using the G command followed by the coordinates of the position to which you want the cursor to go.

Glyphix has tha ability to eutomatically make certain geometric shapes in e choice of sizes. If you press the E key and follow it with parameters describing the size and angles in the shape, the program will autometically draw circles, arcs, and pie segments. This Glyphix command actually allows you to access the Circle command in BASICA. The program conteins standard parameters that it passes to the interpreter if you don't override them. These parameters include the radius, color, start, end, and aspect of the figure to be drawn. Aspect is the ratio of height to width of the figure; i.e., if you give 3 as the aspect, an ellipse drawn by Glyphix will


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*Figure 3: A screen dump from Glyphix demonstration disk.*




be three times as tall as it is wida. This measurement is approximate because the figures are formed of pixels and a pixel is considerably higher than it is wide.

It takes some patience to drew good circles and arcs with the E command. If tha program's defeult velues are not used, you must designete the new parameters carefully in order to avoid en illegal entry. Since tha program providas no visual prompts, both naw and exparienced users must rely heavily on the manual.

One of the simpler Glyphix commands is B, for box; this creates e box of a certein size at e specifiad location. Two keystrokes are needed to define the opposite corners of the box you wish to draw. The third and finel kaystroke talls tha program if the box should be filled in (you type F) or drawn in outline (you type CR).

*IT IS difficult to use Glyphix without referring constantly to the manual, but the program does contain some clever audio prompts.*

Once a figure is on the screen, Glyphix ellows you to lift it end store it in e shape table. The shape tables you creata in RAM can be stored on the disk. Afterwerds, you can duplicata the shape as many times es you like on the screen. You can pull the shepe in any direction using the eight cursor keys; then you can tack it down by entering e carriage return. The progrem provides e table of shapes that includes the logic symbols commonly used on a standard flow chart.

Glyphix also provides for easy antry of text, so drewings can be clearly lebeled. You cen pull each latter around tha screen until it's positioned when you press the next letter key.

It is difficult to use Glyphix without referring constantly to the menuel, but the program does contein some clever audio prompts. I, et least, think they are clever. Other peopia find them frustrating and irritating. The author of Glyphix, Jaff Duntamann, has included the following audible clues to the operation of the system. Whan you meke e legal keystroke, the speakar sounds a pleasant little tone. An illegal entry brings the electronic equivalent of a Bronx cheer. When the program puts e box on the screen, it plays its own little "box song." Commands that might result in the loss of data, such as clear screen, ere met with a iittle five-tone song thet seems to say, "Are you really sure?" If




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## A New Deal for PC-Draw

*An updated version of PC-Draw should be more convenient to use than the original.*

Micrografx has announced an enhanced version of *PC-Draw* that will increase its ease of use, user friendliness, and functionality. The upgrade, version 1.1, is being supplied free of charge to present users of version 1.0.

Version 1.1 increases the number of functions selectable by a light pen; this device can support all menu selections, most Alt combination key functions, cursor control, as well as circle and freehand line drawings.

The new version provides an alternate text function to facilitate user selection of text symbols. The text template includes two text fonts.

*PC-Draw* 1.1 offers many new functional capabilities. You can change drawings or templates without exiting a drawing session, create circles via a function key, draw diagonally in the pixel-draw mode, select and manipulate block symbols, fill in symbols, and rotate print sideways. It also allows horizontal paging, and full-width condensed print (two pages printed side by side).

The program's over all performance has also been enhanced. Drawing and template files now use approximately half as much disk space as version 1.0. *PC-Draw* 1.1 still is priced at $250. —*F.J.D.*

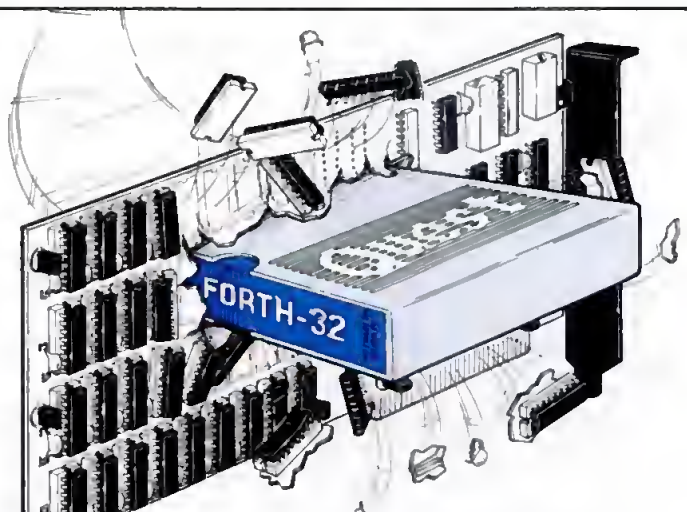
## *AN ILLEGAL entry brings the electronic equivalent of a Bronx cheer.*

you are really sure, the program responds with two tones that sound like "OK!", then executes the command. I liked the audio very much, but if you are the type who expects a program to sit there and do your bidding quietly, the audio can be turned off with a single command.

Glyphix is an unprotected BASIC program. It can be listed and modified, and it is full of comments so that you know what the various program segments do. You can change the program to suit your needs.

The *Frieze* printing program, available separately, is needed to transfer the drawings created with *Glyphix* to a printer. *Frieze* can also be used to save complete screens created with Glyphix. Up to nine screens can be quickly recalled from the keyboard. A simple BASIC program can be used with Frieze to bring in up to 256 different screens. This has obvious uses, such as preparing a "slide show" with the PC for a business presentation.

*Frieze* is written in 8086 assembly language. It can be stored in RAM along with the *Glyphix* program and BASICA. You start the program by pressing the PrtSc key while in the graphics mode. *Frieze* will dump drawings to any Epson MX-series printer equipped with Graftrax; the IBM PC printer; IDS 450/560 with the G option;


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*A SIMPLE BASIC program can be used with Frieze to bring in up to 256 different screens.*

for screen dumps in color; the IDS Prism and Prism Color printers can be used. See Figure 1 and Figure 2 for examples of Glyphix printouts.

Glyphix is a capable and economical program that makes the creation of graphic drawings easy. But, remember, there are other competing software packages.

**PCcrayon**

PCcrayon has many of the capabilities of Glyphix. The approach of the program is the same in that it provides a higher-level command language to interface with the BASICA graphics functions. PCcrayon does not provide the clever audio clues that come from Glyphix. Also, I found the Glyphix documentation to be much easier to use and much more readable. The Glyphix manual contains many helpful hints and even suggestions of mnemonic phrases to help you remember the commands. The manual for PCcrayon seems to have been written by someone locked into a large mainframe-computer mind-set. One clear indication is the instruction to IPL the DOS system. Aside from being redundant, this expression is a candidate to win the mainframe-mentality award in the terminology class. The documentation also sends you to the IBM BASIC reference manual to explain relatively-simple concepts such as the color palettes.

PCcrayon can perform the same kinds of cursor movements as Glyphix—it even uses the same cursor keys. Both direct movement and cursor-controlled movement is possible.

PCcrayon makes a distinction between the way it stores figures and the way it stores lines. Figures are referred to as graphics symbols. Any figure can be saved in a file by defining the corners of the figure. Vector symbols are lines that can be any size, angle, or color; these can be used to create letters or special symbols.

This program is unique in that it can make a recording or "scenario" of the series of steps used to create a display. A scenario is captured in PCcrayon if you use the Z-CAPON command before you begin your drawing. As you create the drawing, the program records every step.

*THE MANUAL for PCcrayon seems to have been written by someone locked into a large mainframe-computer mind-set.*

When you want to repeat the drawing, you can replay the scenario from memory; the program will recreate the screen from the original sequence of stored commands.

An alternate method of saving a drawing is to make a bit-for-bit copy of the 16K memory area on the color/graphics board. Using the scenario, however, takes much


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less disk space. A scenario can be editad or corrected, though this isn't a simpla job; it is easiar to sava a completa drawing with a bit dump. Tha scanario option however, can provide you with a way of transfering graphic files out a modem port as an ASCII stream.

PCcrayon has a Float command that allows you to mova a symbol across the screen slowly. If this command is used in a scanario that includes erasing and clearing all or parts of the screen, the result can be an animated presentation that is played by the PC. When I tried to create this kind of animated presentation, I found I needed to work from a detailad prepared script. This approach was much easiar than tha cut-and-try-and-edit method.

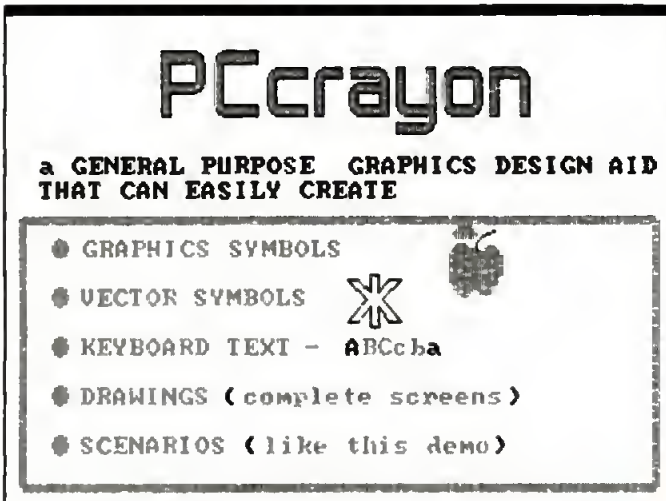



*Figure 4: A screen dump from PCcrayon demonstration disk showing feotures of the program.*

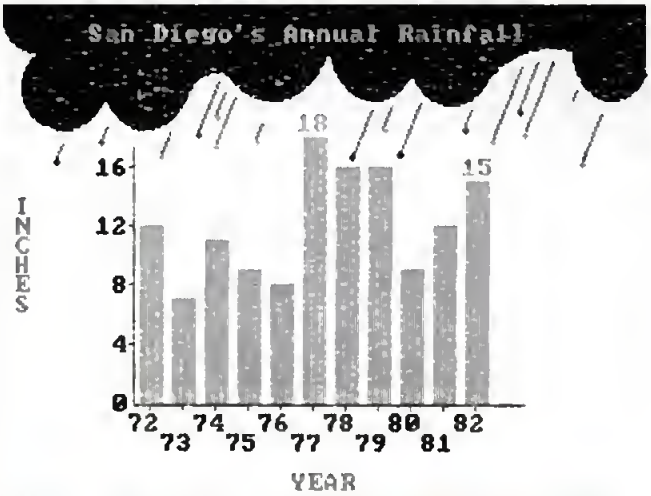
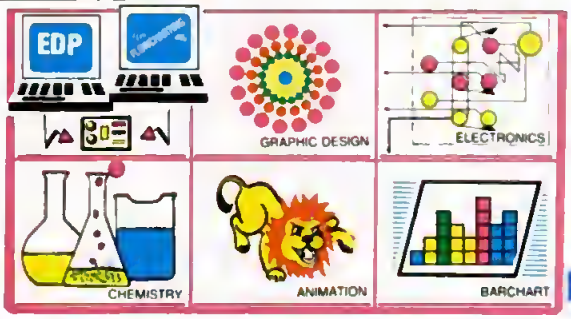
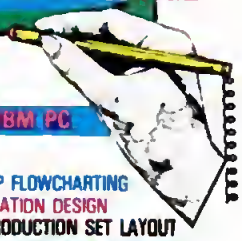



*Figure 5: A screen dump from PCcrayon illustrating features of the program.*


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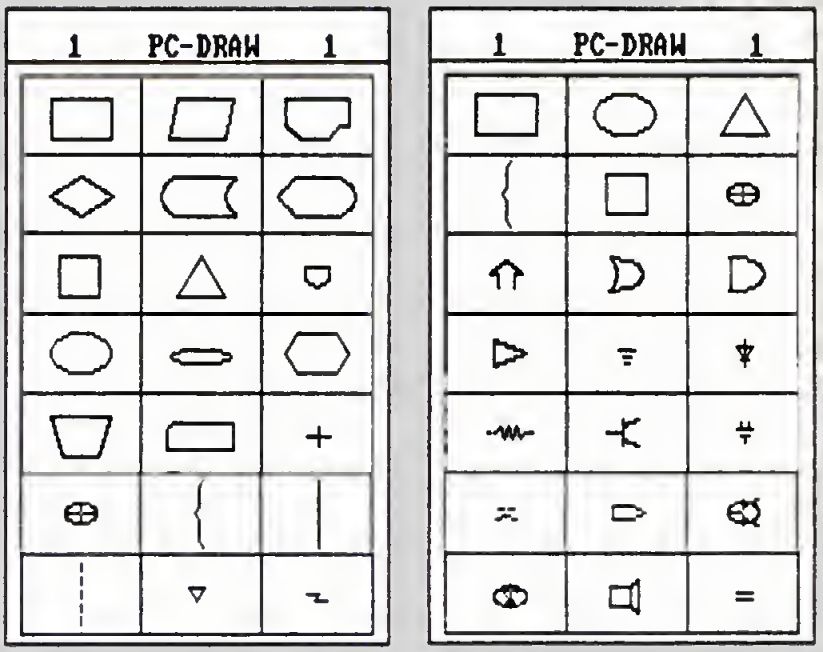
Screens created with this program can be reproduced on an Epson printer with Graftrax. For some sample PCcrayon printouts, see Figures 4 and 5. The PCcrayon package with its utilities costs $44.95.

### PC-Draw

*PC-Draw* seems to be aimed at professional users. It has a more detailed manual than the previous programs and a few more specific user aids. It is not a more "powerful" program, though; the other two programs can do many things *PC-Draw* can not, such as display in color. But *PC-Draw* will appeal to draftsmen and engineers trained in drafting skills.

One appealing feature of *PC-Draw* is the provision of two templates of drawing symbols. One template contains software flowcharting symbols (see Figure 6), and the other holds symbols used in electrical schematics and logic diagrams (see Figure 7). One of these symbols can be selected from the template with the cursor or with a lightpen; then it can be reproduced at any point on the screen. The symbols can

*Figure 6: The two templates provided by PC-Draw. On the left, the Software Flowcharting Template; on the right, the Logic and Electrical Design Template. You can modify these templates and create others.*





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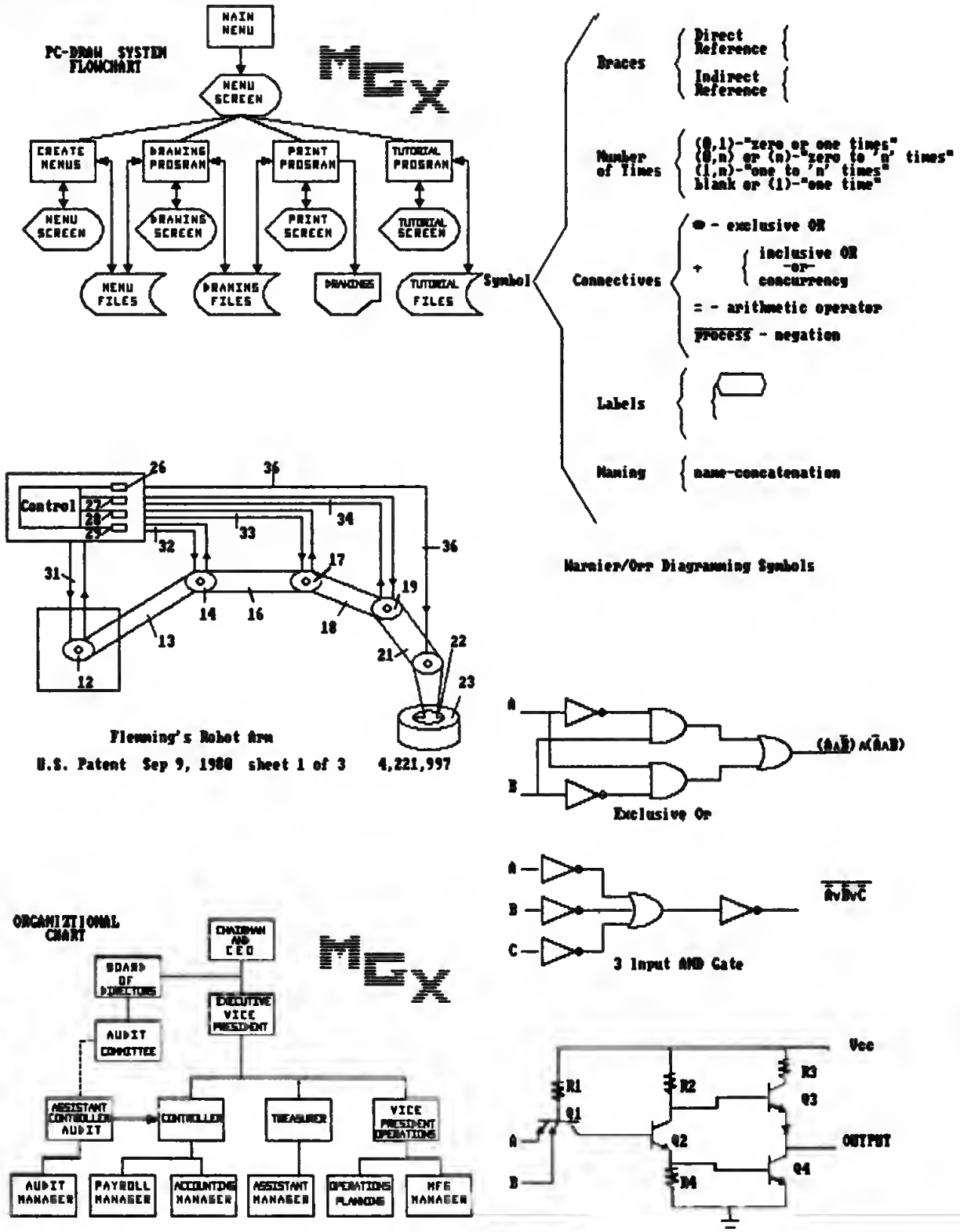
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*Figure 7: A variety of drawings made with Micrografx's PC-Draw, illustrating the program's capability of combining template symbols and freehand drawing to create many styles of drawings and diagrams.*



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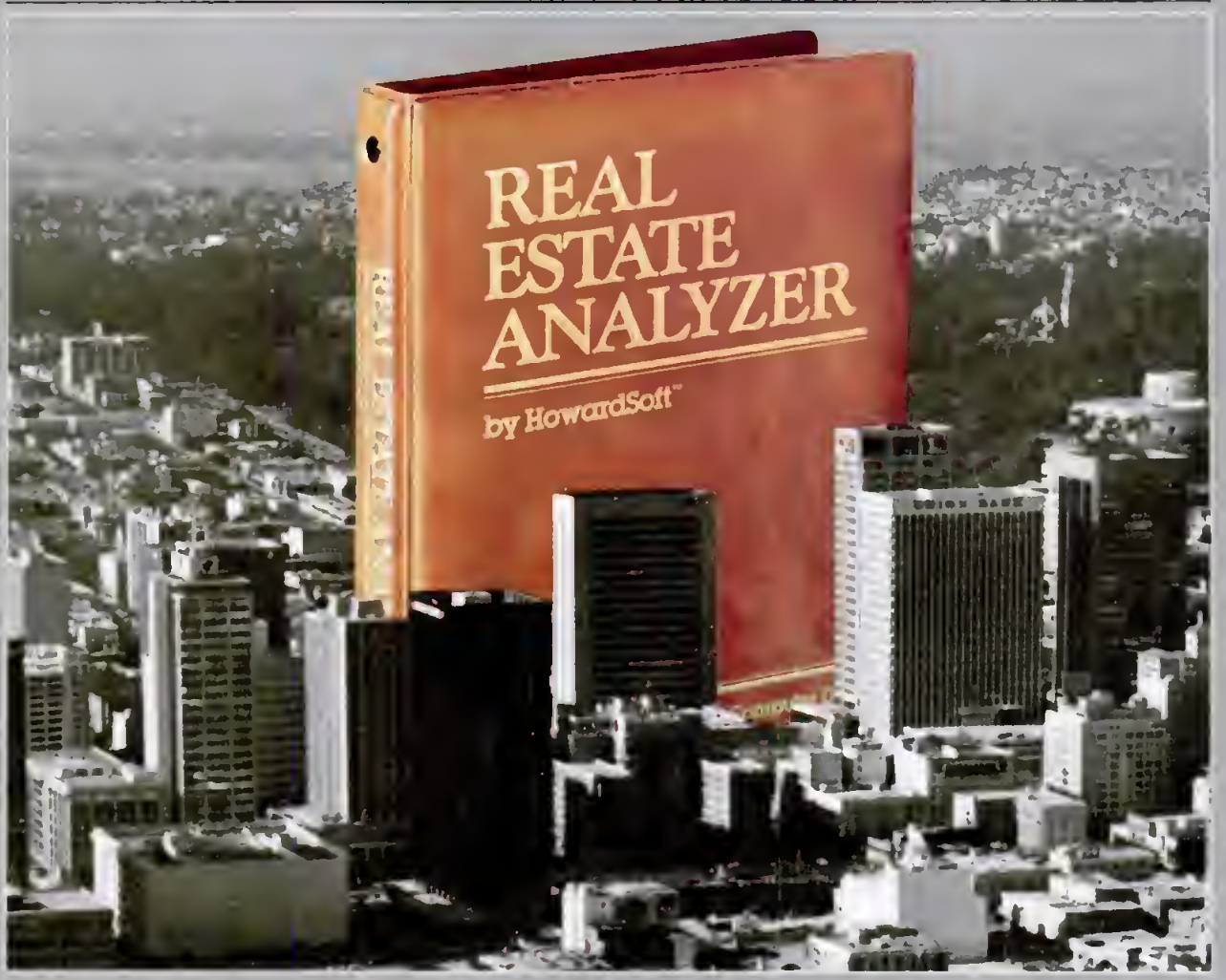
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be rotated in 90-degree steps and expended or contrected in size with simple keystroke commands. You can modify the two existing templetes and make your own templetes to meet your needs.

You can also drew angled lines by ordering the program to connect any two points on the screen. I have not yet, however, figured out how to erase en engled line once it is drawn. I mede several such lines by misteke end suffered greet frustretion trying to erase them cleenly.

*PC-Draw* mekes good use of the PC's special function keys and key commends. Rotetion, expansion, contraction, end many other figure-menipulation commends are controlled with the speciel-function keys.

Drewings creeted with *PC-Draw* can be paged just like peges of text in e word processor program. This gives you the ability to make extra-lerge drewings, such as schematics and logic charts, that can run for severel pages.

*PC-Draw* is oriented toward providing high-quality hard copies of the drewings you make. Two stendard-size print formets are available. The standard and emphesized printing modes put two screen lmeges on e single printed pege. Each printed imege is elmost exectly the same size as the screen imege. An emphesized print mode mekes the print about twice as derk es in the standerd mode.

***ROTATION, expansion, contraction, and many other figure-manipulation commands are controlled with the special-function keys.***

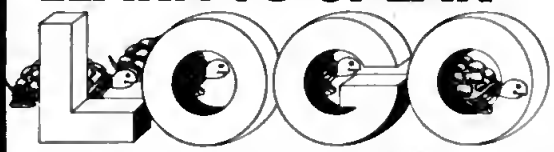
Another feature is condensed printing. Three condensed formets ere eveileble, which are identicel in eppearance except for the place they occupy on the printed page. Using these condensed formets will reduce the size of the drewings by 50 percent so thet four screen imeges will fit on e single page. This gives you the ebility to work comfortebly with large scele drewings on the screen, end then reduce them for reproduction.

The menipulation powers of *PC-Draw* are greet end it is particularly fun to use with a light pen. See Figure 7 for printouts of diagrams creeted with this program. At $250, *PC-Draw* is not inexpensive, but it will certeinly eppeel to users with serious drefting requirements.

### Draw Your Own Conclusion

These programs for the PC renge from the businesslike to the sublime. They can help you use your PC more effectively et home and in business. They teke edventege of the significant grephics capability provided by IBM, giving you another means of harnessing your computer's power for useful end creetive work. */PC*


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- △ Using the idea of recursion—making a simple command repeat itself to perform more complex functions
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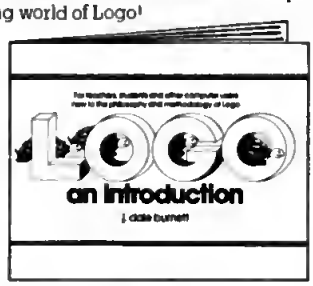
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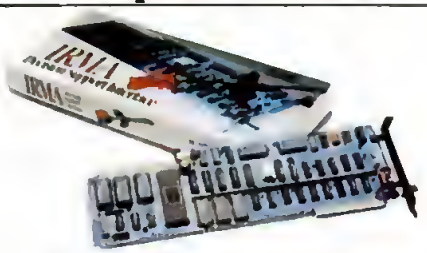


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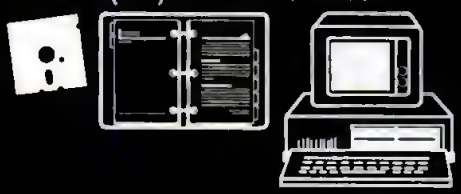


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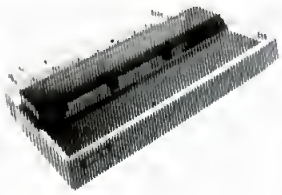
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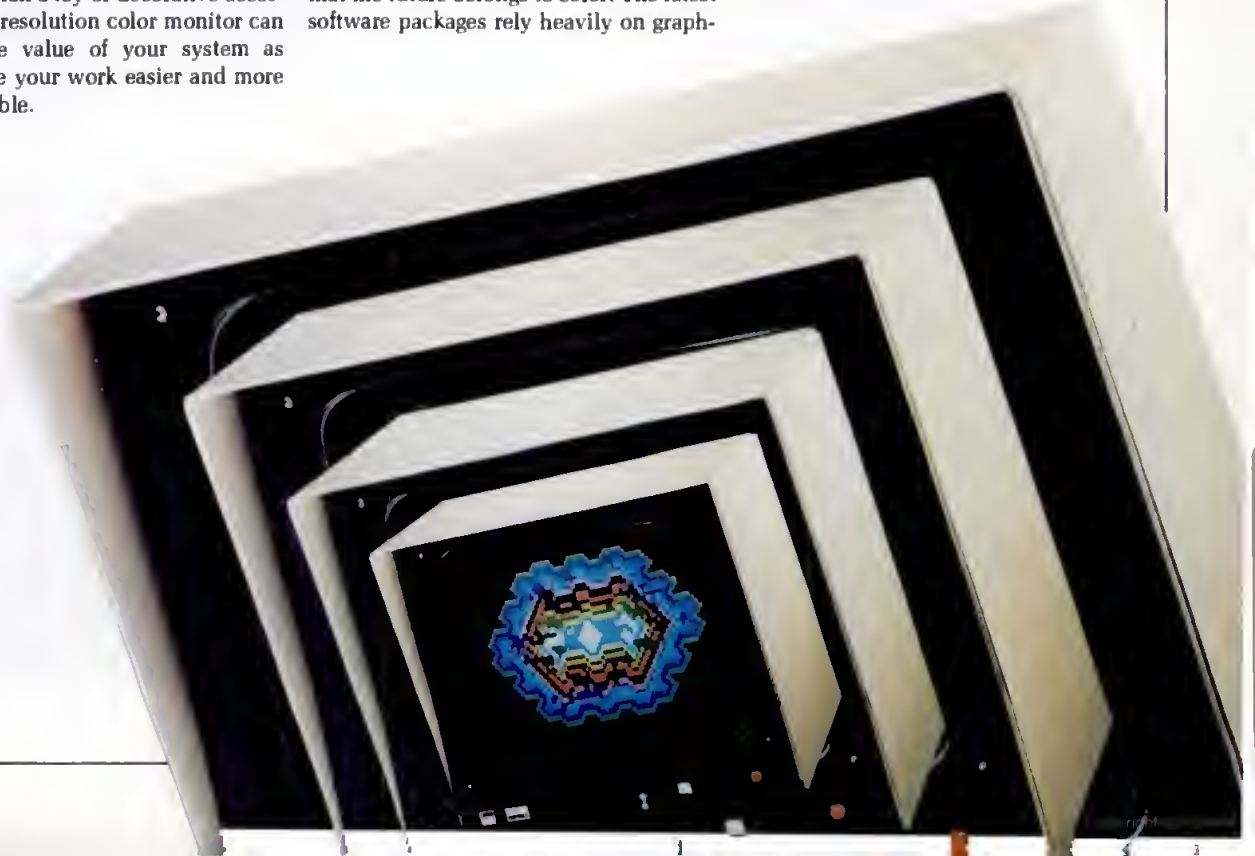
*Color may be all the rage, but before you rush out to buy a rainbow for your PC, take a look at what lurks behind the screen.*

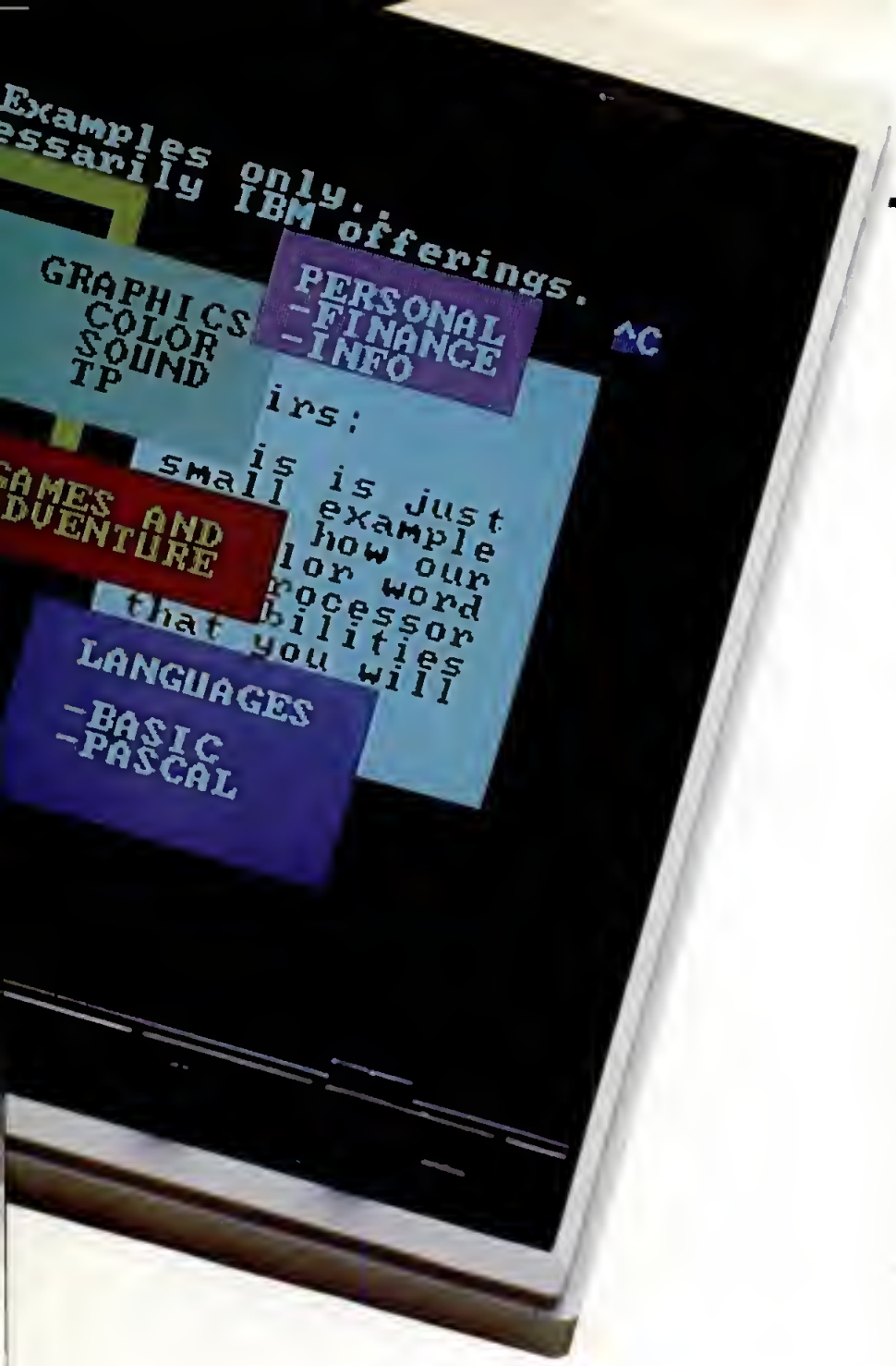
# HIGH-RESOLUTION COLOR MONITORS

To some PC people, color monitors are for playing games. To others, they are status symbols, expensive luxuries to round out their personal computer systems. But if your IBM PC is more than a toy or decorative accessory, a high-resolution color monitor can multiply the value of your system as well as make your work easier and more understandable.

Beyond this, high-resolution color monitors linked with the IBM PC are pointing the way for the next generation of personal computing. One look at recently released hardware, such as the PC-XT and IBM color monitor, should convince you that the future belongs to color. The latest software packages rely heavily on graphics and color capabilities.

The IBM PC itself was designed to take advantage of advanced color capabilities, and, when combined with a suitable color/graphics expansion board, is adept at handling multi-hued screens. Taking full






advantaga of all PC capabilities requires a high-resolution color monitor.

Adding a color monitor can benefit a small system. Color adds excitement and realism to computer games. In business, whare evarything is reducad to a bottom line that is seen only in black and red, color monitors can help isolate data, identify trends, and track production flow.

The variad hues on the color monitor screen clarify and help to separate elemants of the display. New software packages, seeking to mimic the traditional desk-top workspace with "windows" that correspond to many sheets of paper, use a different color for each imaginary piece of paper in order to identify it.

A color monitor conveys ideas and impressions faster than black-and-white (or black-and-green) words. And not only does color speed recognition—consider the common traffic light—but it also conveys emotion and feeling.

Color is so much a part of our lives that most of us dream and think in color. It's only natural that a thinking machine should displey its labors in color to communicate with its human operator.

### The Video Alternative

The link between the PC and your mind is the monitor. Because e monitor bears a superficial resemblanca to a television set, the two are often confused. In fact, a television set edepted with a "modulator" can ba used as a monitor for tha PC; the resulting image is workeble, but hardly satisfying.

***A high-resolution color monitor can multiply the value of your system and make your work easier and more understandable.***

A color television often doubles as a low budgat monitor because nearly every living room already has one. Just about as often, the on-screen picture is disappointing because television sats, by design and construction, can't handle the exacting detail required by a computer system.

Computer monitors are, in fect, a separate breed from tha television, even though both share meny parts and heve the seme ultimete goal: visuel communication. These differences become most apparent when the goal is to communicate in color. A high-resolution red-green-blue (RGB) monitor can reproduca more datail with greatar control then any televisIon can ever aspire to. Color monitors are so named because red, green, and blue are the primary colors of light.

Although color televisions are essentielly interchengeaivla and share common standards (so that thay can receive stendard broadcast signals), color monitors need not be aimed so specifically. While most people judga color telavisions only by their cost and picture quality, color monitors for computers ere distinguished by lengthy lists of specifications replate with terms like "resolution," "persistance," and "type of input."

When you decide to go beyond the

minimal quality of a plain color television as a monitor for your PC, you must match these specifications to your needs and the capabilities of your computar. You should know what all tha terms and specifications mean. To do this, you need to understand how both monitors and television sets work, and how thay diffar.

### RF, Composite Video and RGB

The major difference between a monitor aod a television set is the type of input signal used. Different vidao displays, whather color monitors or televisions, use different signals to produce pictures. Tbe three most common signals are radio frequency (RF), composite vidao, and RGB.

RF is the same kind of signal used for television broadcasts through the airwaves. Most telavision sets hava RF inputs called "antenna terminals."

The IBM PC does not directly produce an RF signal that can be fed to a telavision set. To use a television, the PC raquires a modulator, which acts as a small television station and changes the signals created ioside tha systams unit into RF, usually on channel 3 or chaooel 4.

Most color monitors use either composita video or RGB input sigoals. Composite video refers to a talevision signal before it is broadcast. Tha composite signal combines all the brightness, color, and synchronizing information necassary for operating a monitor or television set into a form that can be transmittad through a single wire or communication channel.

*TELEVISION sets are unable to handle the exacting detail required by a computer system.*

In the United States, all color televisioo stations and most vidao aquipmant use signals that meet the National Television Standards Committee (NTSC) standard. Because a singla standard is used, all of thesa television signals are compatible. Unfortunately, the NTSC standard limits tha quality of televisioo signals. Although tha black-and-white part of the NTSC signal produces a reasooably high-resolution picture, the color parts do not.

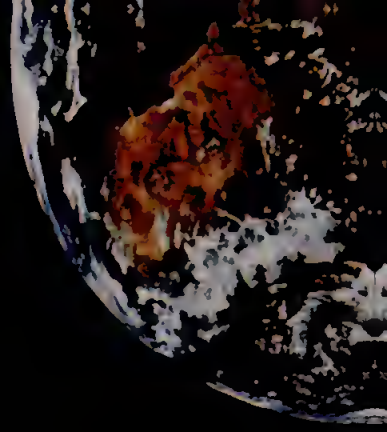
Tha system isn't good anough to reproduce high-resolution graphics on computar monitors. Thus, most computers that connect to telavlsion sets have thair display widths limitad to 40 characters.

The strict limitations that made NTSC necassary need not apply to parsonal computer systems. Ramembar, tha goal of NTSC was to put all necassary picture informatioo into a single telavision chanal for broadcasting (RF) or onto a single wire insida the studio (composita video). This combining process robs NTSC signals of thair datail, a limitation that becomes more apparent for computer-related applications.

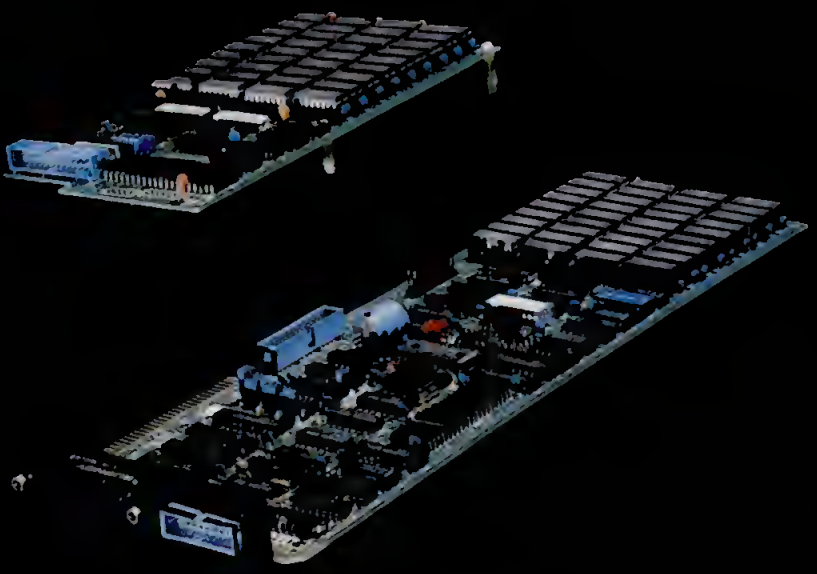
The good news is that the combining process is not nacessary in a computar system. Rather than combining the signals of each primary color, RGB interconnections usa separata wires for aach color channel. Because the system is self-contained, it's possibla to run a faw extra conductors for individual color channels insida an interconnacting cable. Tha cabla runs only a few feet between the systems unit and the color monitor.



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| Manufacturer | Model | Screen Size (measured diagonally) | Resolution (horizontal dots x vertical lines) | Input Type | Number of Colors | Band Width (MHz) | Dot Pitch (mm) | Long Persistence Phosphors | IBM PC Compatibility | List Price (subject to change) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Amdek**<br>2201 Lively Blvd.<br>Elk Grove Village, IL 60007<br>(312) 364-1180<br>circle 587 on reader service card | Color II | 13 inches | 560 × 240 | Transistor-Transistor Logic (TTL) | 7 + intensity | 9 | 43 | no | yes | **$799** |
| **Amtron**<br>Box 1150<br>Aptos, CA 95003<br>(408) 688-4445<br>circle 586 on reader service card | 1308 | 12 inches | 850 × 640 | Analog/TTL | Analog: infinite TTL: 8 | 50 | .31 | yes | yes, with Amtron color card | **$1500** |
| | 1909 | 19 inches | 1280 × 1024 | Analog/TTL | Analog: infinite TTL: 8 | 50 | .31 | yes | yes, with Amtron color card | **$3500** |
| **Aydin Controls**<br>414 Commerce Drive<br>Fort Washington, PA 19034<br>(215) 542-7800<br>circle 585 on reader service card | 8810 | 13 inches | greater than 3000 characters, greater than 600 pixels per line | Analog/TTL | Analog: infinite TTL: 16 | 25 | .31 | yes | yes | **$1600** |
| | 8830 | 19 inches | greater than 4000 characters, greater than 700 pixels per line | Analog/TTL | Analog: infinite TTL: 16 | 25 | 31 | yes | yes | **$1800** |
| **Electrohome**<br>809 Wellington St., North<br>Kitchener, Ontario<br>CANADA<br>(519) 744-7111<br>circle 584 on reader service card | 1301 | 13 inches | 720 × 512 | Analog | Analog: infinite With interface: 16 | 25 | 31 | yes | yes, with Electrohome interface | **$1700** |
| | 1302-2 | 13 inches | 580 × 235 | Analog | Analog: infinite With interface: 16 | 10 | .43 | no | yes, with Electrohome interface | **$728** |
| **Hitachi Sales Corp. of America**<br>401 West Artesia Blvd.<br>Compton, CA 90220<br>(213) 537-8383<br>circle 583 on reader service card | CM 1472 | 13 inches | 560 × 240 | TTL | 16 | 12 | 43 | no | yes | **$725** |
| **IBM**<br>For authorized dealer call (800) 447-4700<br>circle 582 on reader service card | IBM PC Color Display | 12½ inches | addressability up to 640 × 200 | TTL | 16 | not available | 43 | yes | yes | **$680** |
| **NEC Home Electronics**<br>1401 Estes Avenue<br>Elk Grove Village, IL 60007<br>(312) 228-5900<br>circle 581 on reader service card | JC1203D11 | 12 inches | 690 × 230 | TTL | 16 | 8 | .31 | no | yes, with CG-91 cable | **$895** |
| **Princeton Graphic Systems**<br>1101 I State Rd<br>Princeton, NJ 08540<br>circle 580 on reader service card | HX12 | 12 inches | 690 × 240 | TTL | 16 | 15 | .31 | no | yes | **$695** (includes cable) |
| **Quadram**<br>4357 Park Drive<br>Norcross, GA 30093<br>(404) 923-6666<br>circle 579 on reader service card | Quadchrome | 12 inches | 690 × 480 | TTL | 16 | 18 | .31 | no | yes | **$795** |
| **Sony Consumer Products Company**<br>Sony Drive<br>Park Ridge, NJ 07656<br>(201) 930-1000<br>circle 578 on reader service card | KX-1211HG2 | 12 inches | 600 × 400 | Analog/TTL | 16 | not available | 40 | no | yes, with RGB interface adapter PC-7012 | **$895** |
| **TSK (Taxan)**<br>1524 Highland Ave.<br>Duarte, CA 91010<br>(213) 810-1291<br>circle 577 on reader service card | RGBvision III | 12 inches | 630 × 280 | TTL | infinite | 18 | 48 | yes | yes | **$648.95** |

Chart prepared by Lisa Kleinman and Grace Nagiecko

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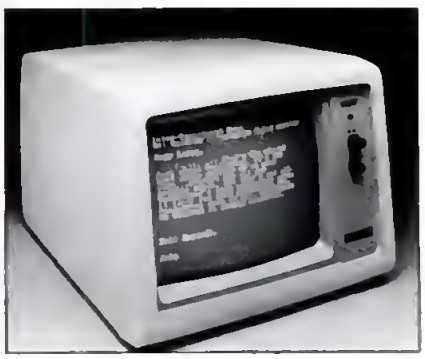
Sometimes when quelity is particularly important, RGB signals ere used in television. In this case, the synchronizing signal (which assures that the electron beams used to assemble tha picture on tba monitor screen are elweys pointing at exactly the right place) is often combined with the green signel.

Using different conductors for RGB interconnections offers several edvantages: Less circuitry is necessary inside both the monitor and computer; fawer manipulations of the signal are neaded; end the bendwidth (which directly translates into resolution and therafora pictura quelity) is not so severely limited.

### Resolution and the Shadow Mask

Once the limitetions of the NTSC signel ere overcome, the ultimate quality of e monitor's image is limited by the picture or cathode ray tube (CRT) that it uses. The image on a monitor screen consists of thousands of glowing dots of phosphor on tha inside surface of the screen. These phosphor dots are arrenged in groups of three (or triplets), one for aach of the primery colors of light. They are made to glow by electron beams shot from three electron "guns" located in the neck of the tube. The elactron beem from each gun strikes only the dots of e particular color.

*THE STRICT limitations that made NTSC necessary need not apply to personal computer systems.*

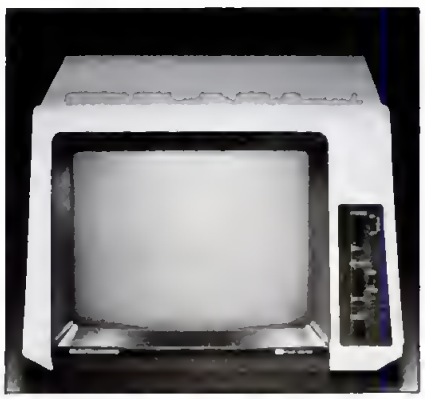


*The Quodrachrame monitor by Quodram*

All color picture tubes, whether used as monitors or televisions, have a "shedow mask," a metal sheet with fina parforations in it, located just behind the pbosphor coating inside the display tube of the screen. Some tubes, like Sony's Trinitron, are a bit different but based on tha same concept. Slots rether then boles ere used in the shadow mask to let the beems pass through, and color stripes rether then phosphor dots meke up the imege.

The shedow mask pravents electron beems in the CRT from striking unintanded phosphor dots and activating the wrong colors on the screen. Essentially, tha alectron gun must shoot through tha holes in tha shadow mask to hit the appropriete phosphor dots.

The specing of the holes determines tha arrangement of the phosphor dots on the CRT screen and the degree of detell of an imege on the screen. This "dot pitch" density determines the fineness of detail in the color resolution.



*Model 1301 by Electrahome*

Color tubes cen be divided by dot pitch into three generel clesses: consumer television quality, with dot pitches .62 millimeter or larger; general purpose display tubes, with dot pitches from .40 to .62 millimeter; and high-resolution displays, with dot pitchas smaller than .40 millimeter. The extra precision required in menufecturing generelly mekes tubes with finer shedow masks and smaller dot pitches more axpensiva.

It's easy to compute the pitch necessary for e given computer system. The screen siza is divided by the number of dots necessery to form tha characters ecross the screen. A typical IBM PC displey consists of 80 columns of cbaracters, each eight dots wida, for a totel screen width of 640 dots. The typical 12-inch (diegonal) monitor screen is roughly 9.5 inches, or ebout 240 millimeters, wide. Consequently, to displey an IBM PC text image proparly, the dot pitch must be smellar than .375 (or 240/640) of e millimeter. This example assumes thet the full widtb of the screen is used for display. Often, a monitor's image is somewhat smeller than full screen width aud requires an even finer dot pitch. Larger displeys can use correspondingly larger dot pitches and still echieve the seme image quality.

The verticel resolution required by the IBM PC is not nearly so strict; 24 lines of text, each line eight dots high, require only 200 lines of resolution. This is eesily obtainad from the .375 millimater or smaller dot pitches required for the necessary horizontal resolution.

*DIGITAL signals have no in-between levels, so each primary color is either turned on or off.*



*Hitochi's Model CM 1472*

### Analog Versus Digital Inputs

Television and computer monitors differ in another important respect. Although e television picture consists of various shades between light and dark, the graphic picture presanted by most computers

*Poor convergence results in images with rainbow-like shadows and a loss of sharpness and detail.*

has few gradations. The IBM PC, for example, displays everything in only two levels of brightness.

To display various brightness levels, television monitor inputs use analog signals, which are electrical waveforms that vary smoothly and continuously with time. The analog signal could be at any one of an infinite variety of voltage levels at any given instant. Each voltage level corresponds to a different brightness or shade of gray on the display screen. Analog signals control each of the colors in a television monitor with such precision that a nearly infinite variety of hues and shadings can be created.

The IBM PC controls its monitor signals differently. It uses digital (on/off) signals. These digital signals have no in-between levels, so each primary color is either turned on or off at each given dot position on the screen. The combination of the three primary colors turned on at each dot position determines the final color shown on the screen.

With three different control signals (one for each of the primary colors, the RGB), each using a different data bit, eight colors ($2^3$) can be produced. By using one additional data bit to control the intensity of the electron beam in the monitor (one bit allows coding of two intensity levels, dim and bright, which correspond to the data signal being on and off), the IBM PC doubles the color palette to 16 colors; at high intensity, there are two values of red, and so forth. Some otherwise PC-compatible monitors do not recognize the added intensity bit and are limited to eight colors. The PC color monitor (and recent models of some other monitors), generate brown by detecting the digital signals that indicate "light yellow." Instead of brightening the yellow, these monitors change the color mixture to add extra red to the yellow blend.

Digital data is sent from the PC systems unit to the monitor as a standard logic signal called transistor-transistor logic (TTL). TTL indicates that an RGB monitor's inputs need a logic signal or signals of a certain industry standard voltage and current level. The RGB outputs of the IBM PC are compatible with this TTL level.

The systems unit also sends two separate synchronizing signals to the monitor to ensure that the electron beams in the monitor's CRT point at the right group of phosphor dots. The vertical synchronizing signal tells the monitor to refresh its complete screen 60 times per second; the horizontal synchronizing signal tells the monitor when each new display line begins (200 times per vertical interval).

It is important to realize that the IBM PC is not directly compatible with analog input RGB monitors. Although technicians can create relatively simple circuits to mate the PC with an analog input monitor, a ready-made adapter may be rather difficult to find.

## Choosing an RGB Monitor

The best way to select a high-resolution monitor is to search for picture problems in any model you are considering.

The first characteristic to check is "convergence." The three electron beams


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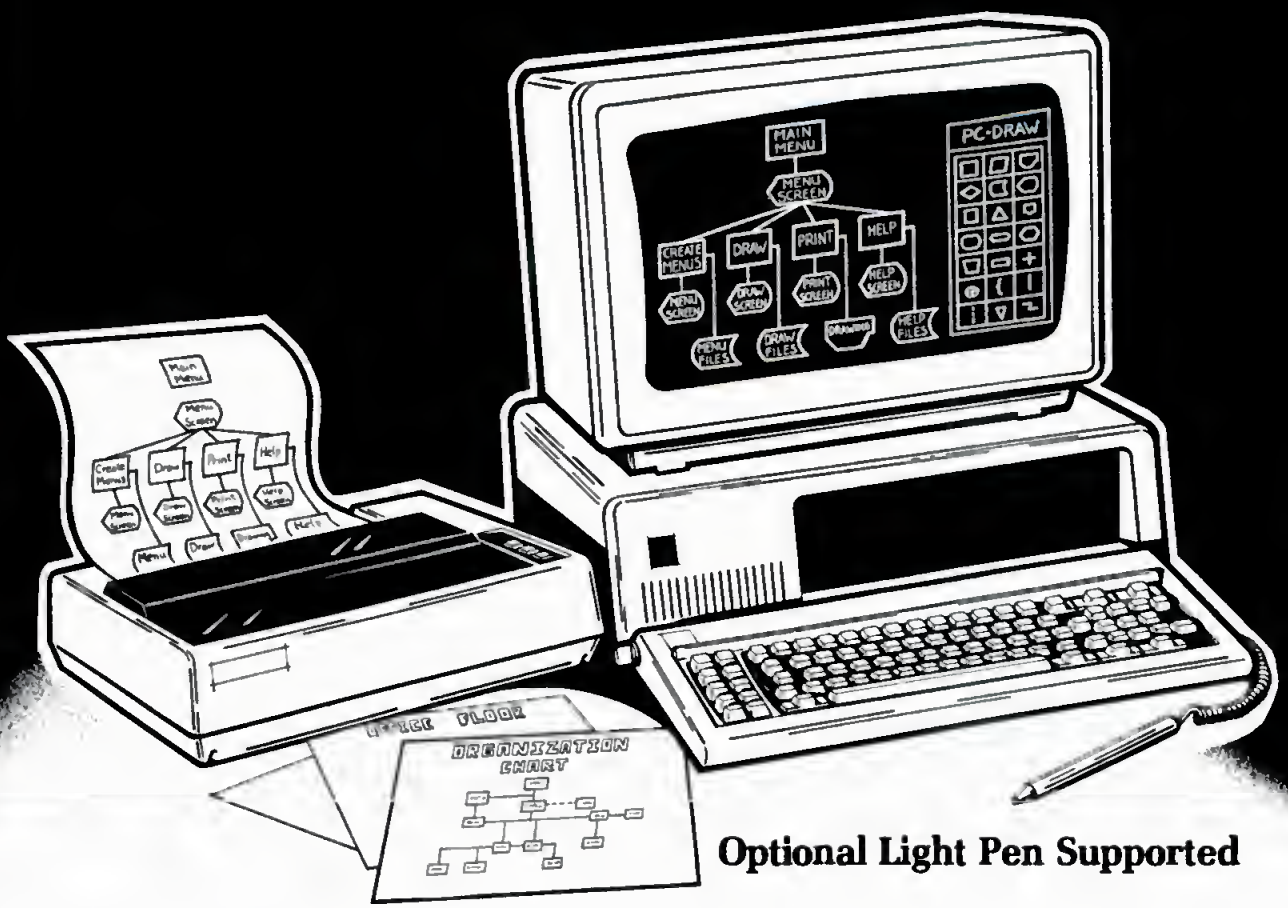
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# NTSC: Never The Same Color

*The limitations of color transmission in the U.S. originated at a time when television was dominated by black and white.*

The big culprit in the poor technical quality of U.S. television Images (and why televisions make poor computer monitors) is not the sets themselves but something called the NTSC. Officially it maans "National Television Standards Committee," but more likely than not, a television engineer will tell you that it stands for "Never The Same Color."

The standards used for color television signals broadcast in the United States (and Japan) were written by the NTSC. Consequently, the signals themselves are often called simply "NTSC."

The reason that there is a standard at all is so that the color signals sent by all U.S. television stations can be received by all television sets in the U.S., a worthy goal now taken for granted.

Thirty years ago, however, setting such a standard was a technological challenge. Color television was new, and various systams of color broadcasting wera under consideration. In the end, it was nack and neck between two: one that would be compatible with all the black and white television sets then in use, and one that was not. Tha first system, championed by RCA, won. It became the NTSC standard that Americans must live with today.

*THAT COLOR could be squeezed in at all was a technical miracle in the fifties.*

The big challenge in developing compatible color television was to stuff extra information about the video picture—the color information—into the airwaves already occupied by tha black-and-white signal. That color could ba squeezed in at all was a technical miracle in the fifties, when vacuum tubes were high technology and room-sized computers boasted capabilities that pala when compared to the microcomputers of the 1980s.

### Mixing Signals

The NTSC is like any other color systam in that the color image is broken into three component images, each representing one of the three primary colors of light: red, green and blua. (Any color can be created by mixing different proportions of the primary colors.)

The NTSC system begins with three talevision signals, the RGB signals, ona for each of the primary colors of light. Than these signals are mixed together to create three intermediate signals: the "luminance" signal, which specifies brightness, and two "chrominance" signals, which spacify color information.

Tha luminance signal contains all tha necessary brightness or black-and-white information and is fully compatible with a normal black-and-white signal. The two chrominance signals, howaver, are squeezed together on top of the luminance signal on a subcarrier of about 3.58 MHz. However, there simply isn't enough room in the signal to stuff in all the requisite color information. This shortage of space (actually, limited bandwidth) means that some colors are restricted to one-third of tha black-and-white resolution by the NTSC process—and others are restricted to about one-ninth of it.

Synchronizing and control information is added to the luminance/chrominance mix along with a "color burst" (which helps television sets guess what the colors should be on the screen) to make a "composite" video signal.

The only reason color television is watchable at all (disregarding program content) is that the human eye does not see color differences as sharply as brightness differences and therefore does not notice the lack of color resolution. Or so say proponents of the NTSC system, who are becoming fewer and fawer.

High-resolution monitors use RGB signals before they get squashed together by the NTSC process. Consequently, RGB signals do not suffer the limitations of the NTSC process and can present sharper, clearer on-screen color images with higher resolution. *—WR*

inside a monitor must converge on exactly the right point on the screen to Illuminate a single set of phosphor dots, or pixel. If a monitor is not adjusted proparly, or if it is not properly designed or assembled, the three beams will not converga correctly. Poor convergence results in images with rainbow-like shadows and a loss of sharpness and detail.

*THE EASIEST way to identify a convergence problem in a computer monitor is to fill the screen with text in white.*

Because the electron beam insida the display tube is bent sharply to reach the corners of the screen, convergence problems will probably appear in tha corners of a display. The easiest way to identify a convergence problem in a computer monitor is to fill the screen with text in white (the combination of the three primary colors) and examine the letters in all four corners of the screen. Should the whita characters hava distinct "shadows" of red, blue, and/or green, you hava probably locatad a convargence problem.

After checking convergence, you should check resolution. According to one source, if you look closely at the screen of a color monitor, you can see the shadow mask lurking behind. If you can see the holes in the mask, they are most likely .40 millimeter or larger. If you can't see the holes, they are probably .31 millimater or smaller. A more straightforward test is to examine a screenful of text (80 columns by 24 rows) to be sure that all the letters are adequately sharp and discarnible.

In regard to convergence or resolution, sometimes the literature describing a monitor speaks of the positioning of the electron guns as "in-line." (The unpublicized alternative is mounted in a "delta," which maans that the guns are arrangad at the verticas of an equilateral triangle.) In-line guns are genarally easier to convarge (point in the proper direction) and can be "self-convergencing," which obviates the

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## HARDWARE

**Amdek**
COLOR I MONITOR ... 349 00
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**Epson**
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**Frederick Electronics**
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**Memory Technologies**
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**Novations Inc.**
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**Okidata**
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SERIAL PORT BOARD ... 135 00
SERIAL PORT BOARO ... 135 00
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PARALLEL PORT BO EXPANDABLE ... 195 00

**Quadram**
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192K RAM BOARO ... 615.00
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OUAOBOARO W/256K ... 750 00
PARALLEL PRINTER CABLE ... 39 95

**Taxan**
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**USI**
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MONITOR 12" GRN ... 189 00
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**Zenith**
MONITOR 12" GRN ... 119 00



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Micro-computer systems and peripherals

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**NOTE:** Frederick Computer Products has a complete line of software, hardware, media and supply items in stock Call for further information & pricing.

Frederick Computer Products has IBM sales and service.

CIRCLE 249 ON READER SERVICE CARD

need for electronic convergence circuitry. The picture tube subsystem, however, mey still require convergence edjustments. Less circuitry means lower prices.

On the other hand, a delta errangement of the electron guns can produce higher picture quality with sbarper focus. This difference is important in critical scientific applications, but it probably will not be apperent when using the IBM PC.

Properly converging e color monitor requires speciel tools and skills. You should never tamper with convergence edjustments. If a monitor pesses your personal visuel inspection, convergence end resolution tests, there's little reeson to worry how the guns are mounted.

While you heve the screen full of text, continue your inspection by examining the top end bottom rows of the display to make certain thet they include all perts of each individuel letter, particularly the top line or two of the uppermost letters and the bottom lines of the lowermost letters. Some monitors may have a tendency to cut slightly into these charecters.

If you plan to run color grephics progrems, you should check the geometric

***THE HUMAN eye does not see color differences as sharply as brightness differences and therefore does not notice the lack of color resolution.***

performence of the monitors you are considering acquiring. Meke sure thet streight lines ere straight and thet squares ere not trepezoidal. Use e veriety of graphics for e thorough test; a problem like poor voltage reguletion (wbich can cause straight lines to waver) may only become apparent when greet demends are mede on the monitor's power supply; for example, when the monitor displays bright, intersecting borizontal end vertical bars.

Sbould you use e color/grephics board other than the one supplied by IBM, the "persistence" of the monitor you select mey be importent. To produce higher resolution some grephics boerds mey use a technique called "interleced scanning."

***MAKE SURE that straight lines are straight and that squares are not trapezoidal.***

Although interlaced scanning can double the vertical resolution on a monitor screen, eech line on the screen is refreshed only helf as often. Instead of being refreshed 60 times e second, the imege is refreshed 30 times e second. Normal phosphors on the screen will "flicker," producing e jumpy Image, beceuse normel phosphors may not retain their brightness long enough to fool the buman eye into thinking the screen is continuously lit. Long persistence phosphors cen make this flicker minimal.

Long persistence phosphors can cause probiems of their own. They may cause "smearing" end efter-imeges. Also, long persistence phosphors ere generally not es efficient es standerd phosphors. Their low efficiency could cause e low brightness thet would be unsuiteble for use in e workspece with bright ambient lighting.

When exemining monitors be sure to note thet some screens ere etched or coeted to reduce glare. Most people find reduced-glare screens easier on the eyes. Although the verious enti-glere finishes vary in durability, most resist the usuai cleaning solvents. And while there mey be slight differences in the epparent effectiveness of anti-glare treetment techniques, the important consideretion is thet reflections from the screen should not interfere with your ebility to see end reed whet's there.

The bleck metrix screen is part of the legacy of edvertisements for consumer model television sets. The term "bleck matrix" refers to the background surrounding the colored phosphor dots on the screen. A darker beckground makes the glowing color dots stand out better; this results in better contrast and, ultimetely, easier viewing. Most high-resolution color monitors use e dark metrix.

Nonblack matrix tubes produce better whites (the bleck of the metrix tubes mekes whites look greyer), which may be desirable for specialized applications (like making photographs of the screen imege). For generel purpose monitor epplications, the readily eveileble black metrix screens are probably best.

### Interference and Style

If you're not a hermit, you may want to check e prospective monitor for complience with FCC regulations. These were written to insure thet monitors do not cause interference to nearby redio listeners or television viewers. The rest of the femily may not be delighted if your computing preempts Julia Child's recitetion of her fevorite means for boning end preparing Rock Cornisb game hens.

The FCC hes two different stendards for the maximum allowable interference resulting from computing devices: Cless A, wbich applies to business equipment; Ciess B, which epplies to computers destined for home use. Because Class B standards are much stricter, e monitor that complies with them will help keep neighbors from pounding on your door every time you run e grephics program.

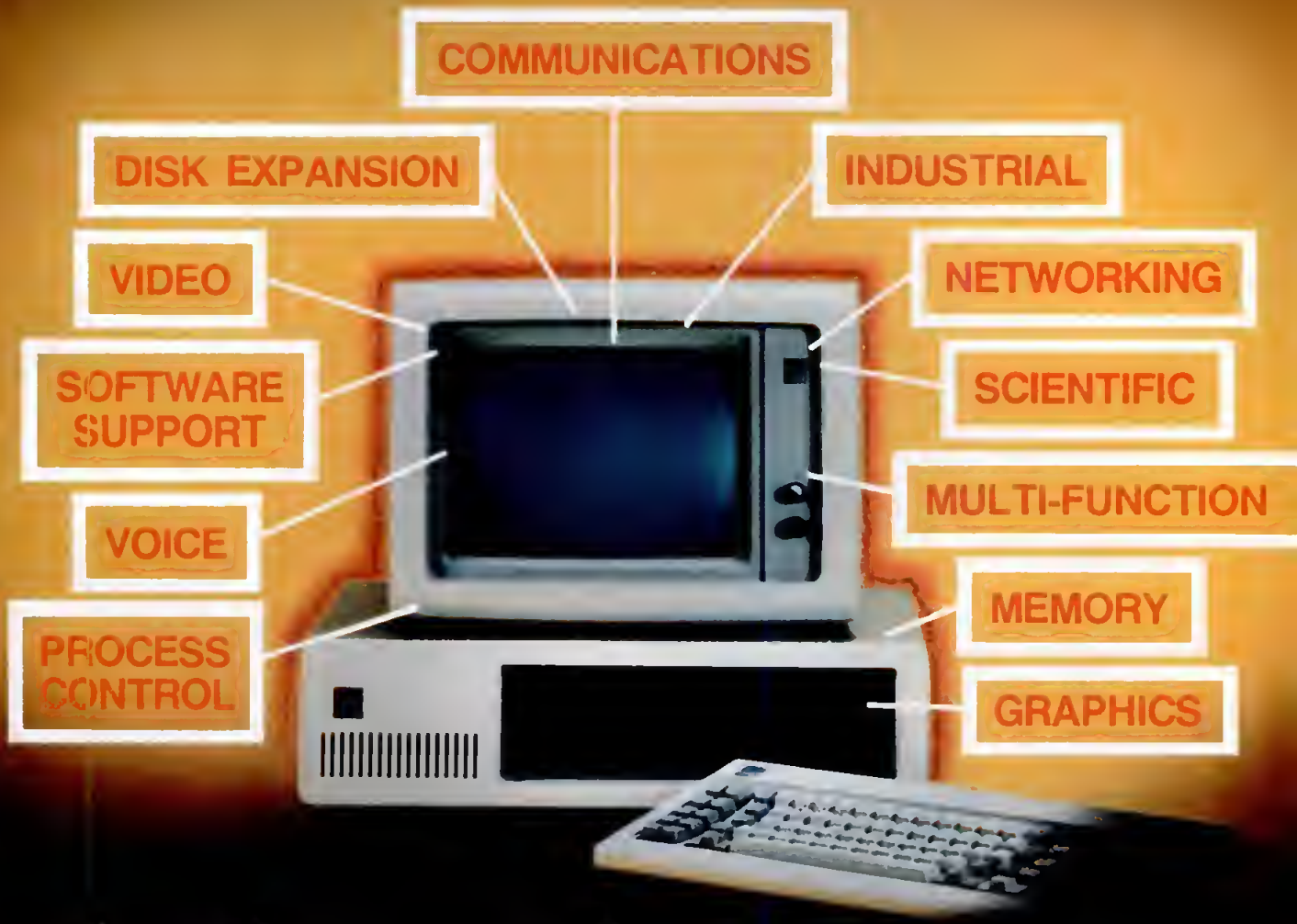
Although the cabinet of a monitor has little effect on its performance, it can still be importent. When you're examining monitors, don't forget to consider whether you can live with its styling.

***IF A monitor passes inspection, there's little reason to worry about which way the guns are mounted.***

Remember, the purpose in buying any high-resolution color monitor is to fecilitate communication between your PC end your eyes. You must be the ultimate judge. The monitor you choose should be the one that looks best to you, both on the screen and in your home or office. */PC*

# TECMAR

## THE POWER BEHIND THE PC




## IN THE COMPLEX PRODUCT MARKET OF IBM PC ENHANCEMENTS, NO ONE OFFERS:

- More complete IBM PC expandability
- More solutions to today's business and technical computing problems
- More assurance of future compatibility with the next generation of technology
- More product reliability

## TECMAR IS THE SAFE DECISION FOR TOMORROW'S PRODUCTS

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CIRCLE 619 ON READER SERVICE CARD

# ComNet™ FROM TECMAR

### NETWORKING
- Ethernet
- Electronic mail
- Device sharing
- No dedicated server required
- Operates with no floppy-based system
- Remote job execution
- File lock out
- Password protection
- Server back-up available

### TELEPHONE SUPPORT
(available through modem board)
- Autodial - with extended telephone numbers
- Auto Redial
- Call Forwarding
- Length Of Call Indicator
- Directory Support - with unlimited number storage
- Message Support - either leave or obtain messages. Receive messages remotely
- This unit (with a handset) substitutes for a telephone

### MODEM
- Gateway to networks
- Electronic mail
- Device sharing
- Remote job execution
- File lock out
- Password protection
- 300 to 1200 baud modems available
- Data in network can be obtained by decoding touch-tone sequence or through voice recognition prompt
- Respond to remote terminal
- Access dictating systems on network. Control them by touch-tone decoding
- Programs or calculator can be used remotely. The touch-tone keypad can be used to provide numeric input to programs or the calculator from a remote site (programs are loaded by decoding touch-tone sequences).

### VOICE
- Voice mail
- Voice annotated text
- Voice messages

### VOICE RECOGNITION
- Transparent keyboard. Speak instead of type
- Give commands ove phone

**ComNet**

ComNet is designed to meet your total communication needs including computer to computer (networking), person-to-computer and person-to-person communication requirements for data and voice.

The network protocol employed is the industry standard high speed Ethernet which permits a number of IBM PC's to be linked together by ordinary thin coaxial cable. In addition to its own computer's power, a user has the availability of other devices which are also attached to the cable - such as various printers, plotters, large disks, etc.

All versions of ComNet include an Ethernet interface and conversion of voice into data and back again. This enables one to give and recieve spoken messages from any location, as well as storing that message for later transcription. The SECRETARY is the basic system with these features.

### SECRETARY $1695[1]
- Ethernet Link
- Ethernet Companion
- ComNet Software



### EXECUTIVE $2995[1]
- Ethernet Link
- Ethernet Companion
- Modem (300 Baud)[2]
- Voice Recognition
- Microphone
- ComNet Software

[1]With **1st MATE**, **2nd MATE**, or **3rd MATE** in Station

[2]Option: 1200 Baud Modem

# MPROVE PRODUCTIVITY
# THROUGH TOTAL COMMUNICATIONS SUPPORT

### CTATING SYSTEM

- Control the Pearlcorder X-02 or XR dictating system at local or remote stations through keyboard or foot pedal control or by telephone touch-tone decoding. Allows you to dictate to the "ComNet" system from any place in the world.

### FOOT PEDAL SUPPORT

- Controls dictating system
- Controls response to voice recognition

### SOFTWARE

- Time Management alerts you to appointments at any station you are logged onto.
- Message Management - either electronic mail or voice.
- Clock/Calendar - either visual or audible
- Calculator - either visual or audible
- Voice Management oversees voice mail, voice message and voice annotated text operations

**These software packages can be operated through voice recognition (even over telephone) with voice output, through the telephone keypad with voice output or through the IBM PC keyboard**

The MANAGER system adds a modem which can turn the PC into a telephone if a separate handset is added. The modem enables the MANAGER to receive unattended voice and data from any telephone in the world. The MANAGER can key in commands thru the decoding of the tones in the telephone keypad.

The EXECUTIVE is the most complete implementation of ComNet, adding computer recognition of spoken commands. An executive might phone the PC to leave or retrieve messages or request specific information. The PC, in a spoken voice, can request the user's access code (or respond to questions regarding which of several options is desired). The EXECUTIVE has the option of keying in answers or commands with the phone's tone dialing buttons, or simply speaking the answer or commands.



**MANAGER $1995[1]**

- Ethernet Link
- Ethernet Companion
- Modem (300 Baud)[2]
- ComNet Software

## HARDWARE

**ETHERNET LINK** **$950**
Permits communications between computers at extremely high speeds (10 Mbits per second). The transmission mode is through single video coaxial cable with easy-to-use BNC connectors.

**ETHERNET COMPANION** **$695**
Performs the function of voice digitization and voice replay, dictation machine control and foot pedal control. Also contains interface for mouse.

**MODEM**
**103 (300 Baud)** **$295**
**212A (1200 Baud)** **$695**

- 103 (300 Baud) or 212A (300 or 1200 Baud)
- Pulse/tone automatic dialer
- Dual tone DTMF receiver (decodes touch tones)
- Auxiliary voice circuit
- Auxiliary, optically coupled, ring indicator output (capable of being used for auto power-on)
- Can replace telephone with the addition of a handset

**VOICE RECOGNITION** **$995**
**MICROPHONE** **$170**
User-dependent 100 word recognition (200 words optional) with 98% accuracy. Permits computer to respond to voice input.

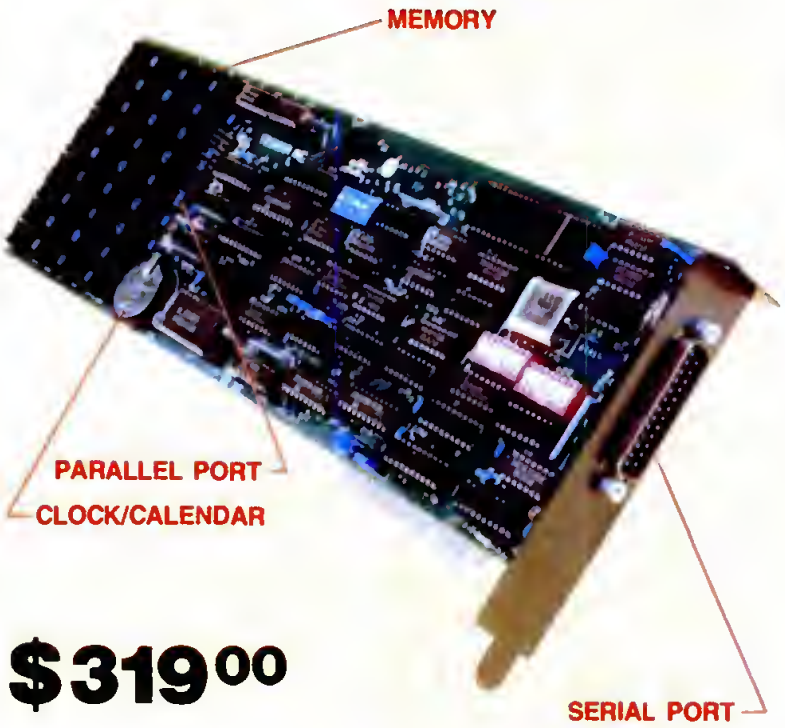
**MORE TO COME...**
**ComNet FROM TECMAR**
**AVAILABLE IN JULY, 1983**

**SOFTWARE**
Cost per station equipped with Tecmar **1st MATE,™ 2nd MATE,™** or **3rd MATE.™**
$100 per station
Cost per station not equipped with Tecmar **1st MATE, 2nd MATE,** or **3rd MATE.**
$300 per station

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CIRCLE 627 ON READER SERVICE CARD

# FIRST FROM TECMAR




**$319.00**

## 1st MATE™

**$319/Unpopulated Memory**
**$389/64K $469/128K**
**$539/192K $589/256K**
**TECMAR'S TOP OF THE LINE MULTI-FUNCTION BOARD**

Performs eight (8) key functions in one (1) expansion slot with upgradeable (expandable) memory.

- 0 to 256K Memory - fully socketed for easy field upgrade
- Versatile - each 64K fully addressable
- **CLOCK/CALENDAR** - with easily replaceable battery for back-up
- **SERIAL PORT** for communications - PC compatible (COM1, COM2 or other)
- **PARALLEL PORT** for printer - PC compatible (LPT1, LPT2 or other)
- **RAM SPOOLER** - easy to use - allows printing to become background task - choice of 8 memory sizes
- **SPEED DISK** - simulates ultra high speed disk
- **AUTO-TIME** - provides automatic insertion of date & time at power on
- Accepts exclusive **PAL** Option to restrict certain information on a "need to know" basis or to protect software
- Includes all connectors and cables
- Compatible with COMPAQ personal computer



Two 64 KILOBYTE MEMORY KITS will upgrade your 128K PC to 256K.

## 64 KILOBYTE MEMORY KITS $85

**USE TO UPGRADE THE PC XT SYSTEM BOARD OR PC-MATE 1st MATE**




**$295.00**

## 2nd MATE™ $295

A wide range of I/O options - 4 ports with a clock/calendar when memory is not necessary

- Two (2) **SERIAL PORTS** for communications, quality printers, modems - PC compatible (COM1, COM2 or other)
- Two (2) **PARALLEL PORTS** for printers - PC compatible (LPT1, LPT2 or other)
- **CLOCK/CALENDAR** with easily replaceable battery for back-up
- Accepts exclusive **PAL** Option to restrict information on a "need to know" basis or to protect software
- Two (2) cables - one (1) serial, one (1) parallel - included
- Compatible with TI Professional and COMPAQ personal computers

# PC MATES™ - A COMPLETE SERIES OF MULTI-FUNCTION MEMORY/COMMUNICATIONS BOARDS THAT GIVE YOU TOTAL VERSATILITY TO CONFIGURE YOUR SYSTEM.

## 3rd MATE™ $445
### ON-BOARD MODEM AND I/O OPTIONS

Pulse-dialing supported with no external cables or wiring. All you need is a phone jack.

- **MODEM** - 300 Baud, Bell 103, auto-dial, pulse-dialing supported, on board
- **SERIAL PORT** - for additional communications - PC compatible (COM1, COM2 or other)
- Two (2) **PARALLEL PORTS** for printers - PC compatible (LPT1, LPT2 or other)
- **CLOCK/CALENDAR** with easily replaceable battery for back-up
- Designed to accept exclusive **PAL** Option to restrict certain information on a "need to know" basis or to protect software
- Two (2) cables - one (1) serial, one (1) parallel - included
- Compatible with TI Professional and COMPAQ personal computers

NEW!

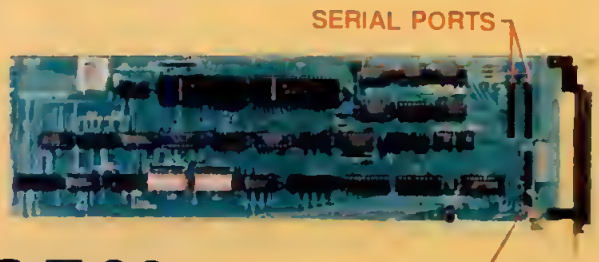



**$445.00**

## Scribe Tender™ $195

Combines three (3) IBM options on one (1) multi-function board

- Two (2) asynchronous **SERIAL PORTS** identical to IBM ports, (COM1, COM2 or other) fully programmable
- Complete status reporting
- One (1) **PARALLEL PORT** emulates IBM printer adapter board, (LPT1) including software capability
- Compatible with TI Professional and COMPAQ personal computers

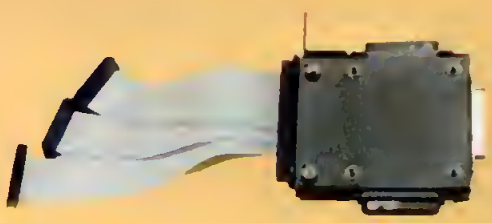



**$195.00**

## Triporter™ $95

Designed to provide easy access to the connectors on multi-function boards, such as the Tecmar **Scribe Tender**, **1st MATE**, **2nd MATE**, **3rd MATE**. Provides for mounting of up to four (4) male or female DB25 connectors on back of IBM PC or Tecmar Expansion Chassis slot. (Cables $25 extra)

- Easy to install
- Accommodates 26 conductor cables
- Mounts in expansion slot opening
- Housed in steel case



**$95.00**

**THE TECMAR PRODUCT LINE ADVANTAGES**
- All Tecmar products carry a full one (1) year warranty
- Guaranteed 72 hour repair service (24 hour average)
- Total compatibility with IBM PC and all Tecmar products
- Proven reliability
- Strong manufacturer's support with immediate access to Customer Service
- Largest selection of IBM PC compatible products in the world

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CIRCLE 553 ON READER SERVICE CARD




complete with controller & cartridge

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# NEW REMOVABLE CARTRIDGE WINCHESTER

This is the breakthrough in storage that IBM PC people have been waiting for, as Tecmar engineering keeps you moving ahead.

- the new SyQuest 5 Megabyte removable cartridge Winchester disk drive
- complete, easily installed in IBM PC or available in IBM-compatible Tecmar expansion chassis
- new Tecmar superspeed controller
- Tecmar disk sharing for up to 4 IBM PCs
- your best solution for mass storage, and the most sensible back-up system available.

We believe this is the future in storage because we have proved its reliability and its advantages. The new removable cartridge gives you unlimited memory at a lower price tag than the basic Winchester at comparable speed.

$1795 complete with controller & cartridge

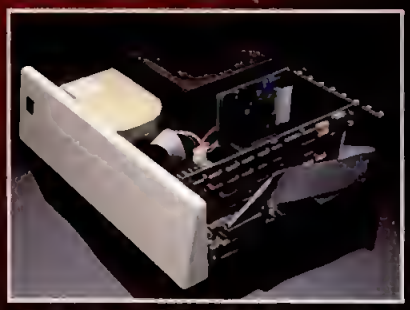
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**TECMAR COMPATIBILITY, VERSATILITY, RELIABILITY, AFFORDABILITY, RESPONDABILITY**
The first and only complete line of fully compatible expansion options for IBM PCs, including every type of disk drive



**NEW SHARED WINCHESTER PC-MATE™**
Our new GT subsystem upgrades our original with 3 times faster speed, sharing for up to 4 IBM PCs . . . Controller Board available for upgrade on trade-in.



**PC-MATE™ FLOPPY**
Controller Board will handle 5¼" and 8" disks. Winchesters can be installed in our floppy subsystem cabinet.

CIRCLE 616 ON READER SERVICE CARD




**PC-MATE BAK-PAK WINCHESTER BACK-UP 6.25 MEGABYTE DISK PACK $1595.00**

The "Bak-Pak" System comes in an IBM-Compatible/**PC-MATE** Mini-cabinet complete with software, power supply, controller and cables. Features removeable media in packs with 6.25 megabytes of formatted storage per pack. Additional packs available at $95.00.

The controller substitutes for the IBM floppy disk controller, so no additional slots are necessary. Also can be used as primary high capacity storage system.



**5 MEGABYTE REMOVEABLE CARTRIDGE WINCHESTER FOR BACK-UP $1995.00**

Comes in IBM-Compatible/**PC-MATE** Mini-cabinet complete with software, power supply, controller and cables.

Can be used as the stand-alone primary high capacity storage device.

WATCH THIS SPACE

New! Tecmar Tape Back-Up Coming Soon

**HIGH CAPACITY STORAGE**
**26 MEGABYTE WINCHESTER $3995.00**

Comes in IBM Compatible/**PC-MATE** Mini-cabinet complete with software, power supply, controller and cables.

- Compatible with all Tecmar disk-expansion systems
- Allows disk sharing for up to four (4) IBM PCs

26 Megabyte Winchester is also availabe in IBM-Compatible **PC-MATE** Expansion Chassis which offers an additional five (5) expansion slots and independent power supply for $4295.00.

Other Winchesters From Tecmar:

- 10 Megabyte in Mini-cabinet - $2495.00
- 15 Megabyte in Mini-cabinet - $2895.00
- 10 Megabyte in **PC-MATE** Expansion Chassis - $2795.00
- 15 Megabyte In **PC-MATE** Expansion Chassis - $3195.00

Other configurations of fixed Winchester, removeable cartridge Winchester and 8" floppy disks are also available from Tecmar. Contact your local dealer or check Tecmar's full-line catalog for details.

# BACK-UP SYSTEMS SOLUTIONS

# HIGH CAPACITY STORAGE SOLUTIONS

Call or write for the latest catalog of **PC-MATE** peripherals from TECMAR. Updated continuously as new products come on-line.




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**THE ONLY NAME YOU NEED TO KNOW**

CIRCLE 549 ON READER SERVICE CARD

# TECMAR'S AFFORDABLE INDUSTRIAL/SCIENTIFIC LINE FOR THE IBM PC

# CONFIDENCE IS NO EXTRA CHARGE.

**COMPATIBLE**
All TECMAR products are designed to be fully compatible with each other and the IBM PC for smooth, trouble-free performance in your system.

**SUPPORTABLE**
Our philosophy of total support adds uncommon value to your TECMAR products. All TECMAR boards feature a one-year warranty, with guaranteed 72-hour maximum repair turnaround on all standard products. Replacement loaner units are available. Thorough and straightforward documentation comes with each unit. Our customer service staff is available to answer questions or solve your problems.

**EXPANDABLE**
Our products allow easy expandability, so your system capabilities can grow with your needs.

There's more! TECMAR's broad line of compatible IBM PC Industrial/Scientific products includes:

- High Resolution Graphics
- 5¼" and 8" Floppy Disc Controller
- Video Digitizer
- Video Cassette Recorder Controller
- Speech Synthesizer
- Voice Recognition
- D/A Converter
- Stepper Motor Controller
- EPROM or EEPROM Programmer/Reader
- Static RAM/ROM
- CMOS Memory



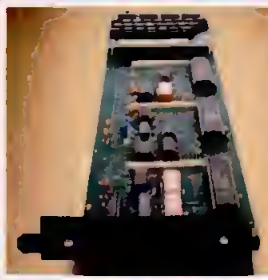
**IEEE488 INTERFACE** **$395**
**plus SOFTWARE** **$95**
Board implements IEEE488 industry standard to enable PC to operate as system controller or as an addressed talker/listener. Has DMA and interrupt capabilities. Available library of machine-language subroutines called from BASIC or FORTRAN for data transactions with GPIB. Order #20030 INTERFACE, #30030 SOFTWARE.



**LAB MASTER™** **$995**
A sophisticated system that includes 16 channels of 12-bit A/D with a 30KHz conversion rate, two channels of 12-bit D/A, five timer/counters, and three 8-bit parallel ports. Options include programmable gain up to 1000, 14- and 16-bit accuracy, 40 and 100 KHz conversion, up to 256 channels. Order #20009.



**LAB TENDER™** **$495**
An economical and versatile system designed for data acquisition and control applications, with 32 channels of 8-bit A/D conversion, 16 channels of 8-bit D/A conversion, five timers, and three 8-bit parallel ports. Order #20028.



**BASE BOARD™** **$345**
Digital Input/Digital Output board with four sections of 24 DI/DO lines. Each section can be used as a stand-alone DI/DO interface or with a daughter board for prototyping or specific functions such as opto-isolated input or opto-isolated output. Order #20025.

We are proud to offer the largest line of options available anywhere for the IBM Personal Computer. All Tecmar products are designed with advanced technology as it becomes available. We add new products monthly, like the PC-MATE removable Cartridge Winchester drive. TECMAR offers complete reliability and backs it up with support.

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# PCMATE™

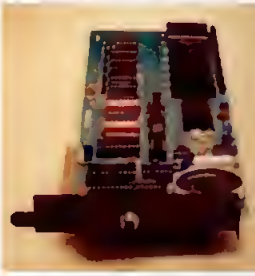
## SOLUTION-ORIENTED DESIGN WITH THE USER IN MIND

## A FULL LINE OF PROBLEM SOLVERS



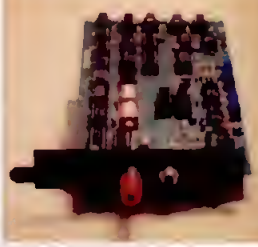
**DIGITAL TO ANALOG AND DIGITAL INPUT/OUTPUT (DADIO)** **$395**

This accurate, high-speed unit has four (4) independent channels of 12-bit digital-to-analog conversion that can be double-buffered (all four (4) output channels change simultaneously), with three (3) 8-bit parallel ports. Can control up to 24 digital devices.



**SPEECH MASTER** **$395**

For any application where verbal response has proven most effective. Uses the VOTRAX phoneme-level speech synthesizer for unlimited vocabulary, and the NATIONAL vocabulary-level synthesizer, for speech synthesis of high-quality with limited vocabulary. Features an on-board speaker with provision for external speaker or amplifier.



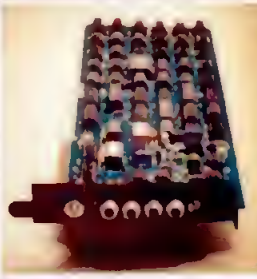
**VIDEO VAN GOGH** **$345**
**plus SOFTWARE** **$95**

A video digitizer that interfaces TV cameras to the PC. Will digitize a black and white picture in six (6) seconds with resolution of 256H by 256V pixels and 256 grey levels. Software library sub-routines allow: digitization and display of a video picture, transfer to disk storage, image-processing, cursor control and point digitization.



**DEVICE MASTER** **$245**
**plus SOFTWARE** **$35**

Can be used for energy management, security, or just for convenience. This interface for the BSR X-10 unit turns electrical outlets on or off and dims lights without additional wiring. It uses no direct AC connection, avoiding damage to the computer. Contains a clock/calendar with alarm and battery back-up.



**VIDEO CASSETTE RECORDER CONTROLLER** **$495**

Controls all remote functions on the SONY SC2500. Codes each frame so the user can locate any particular frame on the video tape, adds frame number information to any length recording, retrieves and displays exact frame by frame number, and when used with TECMAR'S GRAPHICS MASTER, a computer display can be super-imposed on the video picture.



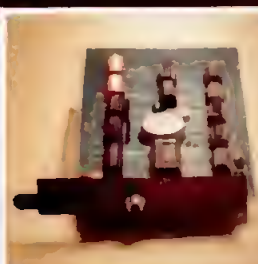
**STEPPER MOTOR CONTROLLER** **$495**

[illegible] that allows you to control one or two (2) stepper motors from the IBM PC. Includes software and cables for one or two motors. Has two (2) 8-bit input ports and labeled 8-bit output ports and two (2) independent 8-bit output ports and labeled 8-bit TTL output ports.



**E+EEPROM PROGRAMMER/ READER** **$495**
**E+EEPROM EXPANSION** **$595**
**E+EEPROM SOFTWARE** **$95**

You can program and read EPROMS or EEPROMS with this unit. The expansion system provides three more sockets for individual or batch programming. The software is user-friendly, with driver routines that enable the user to access, receive and manipulate data to program EPROMS or EEPROMS. Serial communication and printer dump routines are included.



**TIME MASTER** **$135**

A clock/calendar with five (5)-year battery back-up and software auto-time function that automatically inserts date and time at "power-on". With added versatility, this unit will turn the computer on, perform a function, and then turn itself off.

## TECMAR - THE ONLY NAME YOU NEED TO KNOW

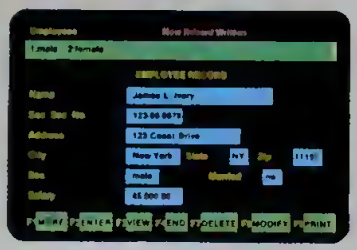
CIRCLE 661 ON READER SERVICE CARD

# DATAEASE™

# The Complete System To Organize Your Business The Way You Want It

**You can start using it in minutes, and within hours have a complete application.**

## It is Easy to Use:



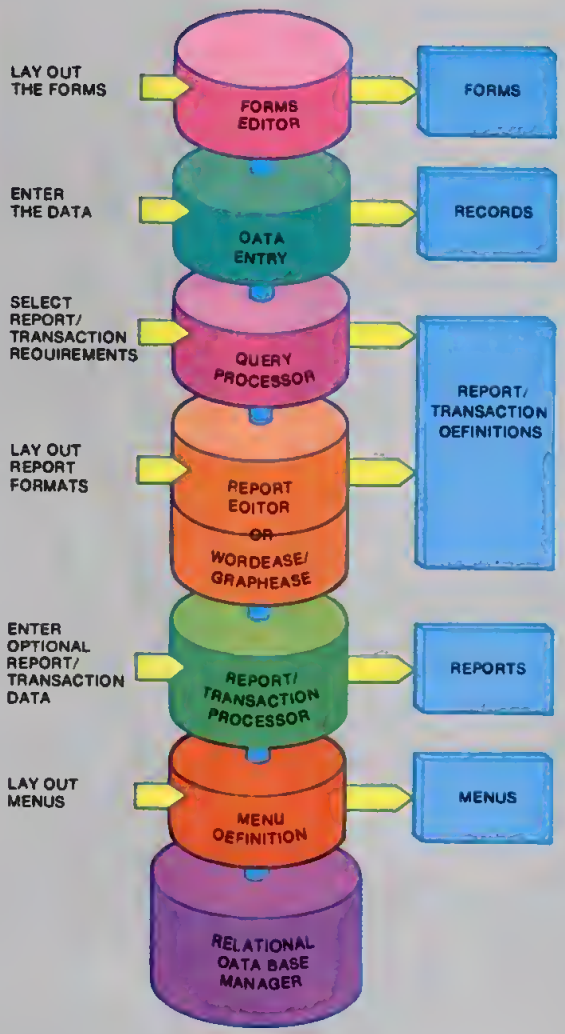
- Fully menu drivan to ramove the guesswork.
- Full use of function keys with the assignments always displayed. All cursor movament and editing functions on tha keyboard ara supported.
- Provides full color support and screen style customization.

## System Features:

- A list of users can be kept, with passwords and security lavals.
- The print styla is customizsbie.
- Data can be interchanged with mainframe computers, other data bssas or spreadshaat programs.
- Dats base back-up and rastore functions are integrated to reduce errors.

## System Requirements:

- Availabie on iBM-PC, DEC Rsinbow and other 16 bit computars. Requires 128K of mamory and 2 disk drives.
- Supports floppy or hard disk drives.
- Supports all populsr printars.




## It Provides A Complete Range of Features:

- Lay out your forms on the screen. Define dsta-entry fialds snywhera by answaring simple questions. Revise the forms any time without losing dsta.
- Easy, fast and sccurate way to flil-in tha forms and anter, view or revise racords.
- The reports or trensactions requiremants ara dafined in the English-like quary languaga by answering simple quastions. Select records any numbar of ways, combine up to 5 forms per raport, parform calculstionss get totals, sub-totals, or stetistical summary. For compiata transaction processing, dalate, modify or entar racords.
- Raports are automatically formatted in several ways, or spacify your own format using the Report Editor.
- To formet a raport complete with text, data, and graphs; usa tha optional WORDEASE™ word-processor or the GRAPHEASE™ graphics facility.
- Display or print tha report output, or take it to your spraadsheet, word processing, or graphics programs.
- Organize tha accass to your forms and raports by setting up your own menus.
- Tha undariying Relational Dsts Base Managar provides afficiant storage and ratrieval of records. It uses B-tree indices for efficient eccassing of records, and cache memory to ratsin the most recantly used disk sectors to reduce disk accass by 50 percent.

## These are Some of the DATAEASE Applications:

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|---|---|---|---|
| Inventory Control | Accounting | Medical Office Systems | Social Sciences |
| Personnel Management | Order Processing | Real Estate | Bibliography |
| Job Accounting | Market Analysis | Agriculture | Library Management |
| Mailing List | Financial Portfolio | Distribution Management | School Records |

## Software Solutions, Inc.

305 Bic Drive, Milford, CT 06460 • (203) 877-9268

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CIRCLE 415 ON READER SERVICE CARD

SOFTWARE/WINN L. ROSCH

*A responsive manufacturer, good design, and a simple, direct program more than compensate for limited documentation and an occasional bug.*

# Fast Graphs: Quick, Colorful, And Easy

*Fost Graphs*
Innovative Software, Inc.
9300 W. 110th St.
Overland Park, KS 66210
(913) 383-1089
**List Price:** $295
**Requires:** 128K RAM, color graphics monitor, two disk drives.

CIRCLE 696 ON READER SERVICE CARD

The difference between a typewriter, an adding machine and a computer is that only the last can manipulate ideas and change their form. The first merely records ideas; the second simply rearranges numbers without analyzing them.

The capabilities of the PC are hardly strained when it's put to no greater use than generating letters and computing income tax. If the preceding sentence describes most of your applications, you haven't discovered graphics. With a few keystrokes, a vague list of numbers can be transformed into a chart that shows numeric relationships instantly.

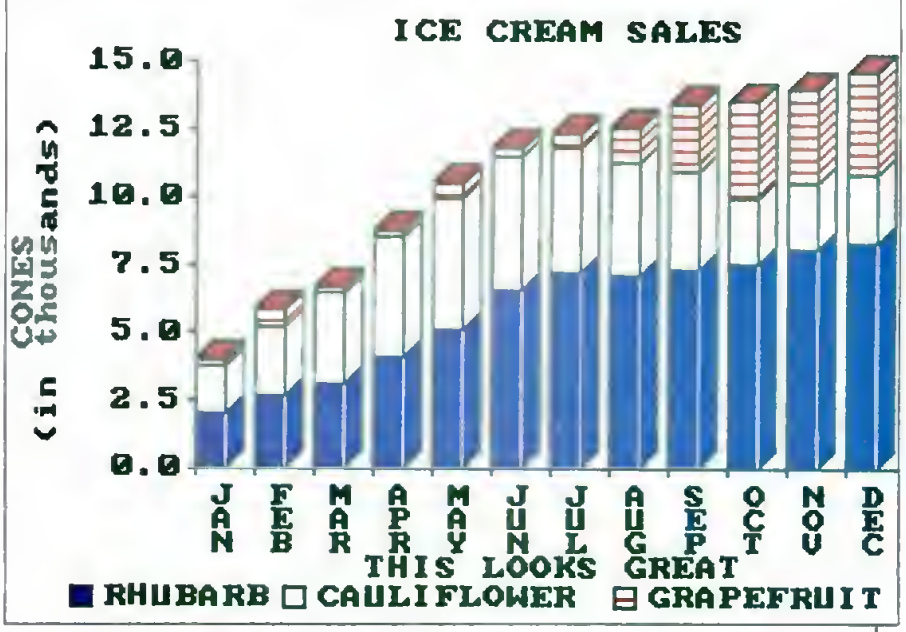
"One picture is worth a thousand numbers," proclaims the advertisement for *Fost Graphs*. The ad is right. And the product delivers more than mere pictures: It charts graphs in full PC color.

Evaluating *Fost Graphs* took me from one adventure to another. My explorations uncovered problems, which I shall point out shortly, that inspired several calls to the manufacturer. These were effective. I received a new, bugless (well, nearly) version of the same program.

## Initial Impressions

When version 1.0 of *Fost Graphs* arrived from Federal Express, I ripped open the shipping carton with great anticipation. My first impression of *Fost Graphs* was very favorable. It is well-packaged, and comes complete with a new manual in a red padded IBM-sized binder. Two disks are also included; one double-sided disk that holds the program, and

*Figure 1: Sample bar chart created with Fast Graphs 1.1*



# VISIWORD MAKES IT EASY TO PUT YOUR BEST THOUGHTS FORWARD.

The better your writing is, the greater the opportunities are to clearly communicate your thoughts, sell your ideas.

The VisiWord™ program for the IBM® Personal Computer can help you make the most of every writing opportunity. It's available for both the IBM PC and the IBM XT with hard disk.

You'll write more effectively with the VisiWord program, because it's designed with the needs of the business professional in mind. It will also help you and your staff work more productively, because the VisiWord program has all the word processing functions your secretary or assistant needs.

You'll find the VisiWord program easy to learn, simple to use. And everytime you use it, you'll be pleased by how much less effort it takes to produce memos, letters, proposals and reports that reflect your very best efforts.

Writing, editing and printing your thoughts are done in a single process that's fast—without waiting for typing and retyping. And your results may be even more professional-looking because what you see on your screen is exactly what you get in your final printed result.

## Easy to learn.

You're ready to write the instant the program is loaded. A simple, uncluttered screen display presents a multiple choice "menu" of functions.

You simply choose which function you want to use and the on-screen prompts tells you how to use it every step of the way.

A QuickStart™ course is included to get you or anyone on your staff producing letters and reports within 30 minutes.

## Even easier to use.

There are no hard-to-use "control" characters. A single keystroke selects all primary program functions—Insert, Delete, Copy, Move, Find/Replace, Storage and Print.

The most-used editing functions are also easy-to-use, because they're done with a single Function Key. These include Center Line, Underline, Delete, Delete To End Of Line, Undelete, Indent, New Page, Decimal Tab and Again.

Dynamic full page formatting lets you see instantaneously on the screen exactly what you'll get on paper. "Word wrap" is automatic for both creating and editing documents.

Additionally, time-saving "help" screens, and a clear, concise User's Guide in plain English give you the assistance you need at a glance.

## More powerful editing with much less effort.

The VisiWord program lets you move, copy, or delete columns of information as well as paragraphs, and even pages, simply and easily.

It helps you make your documents look more professional by automatically formatting and numbering each page, and adding headers and footers if you wish.

And the VisiWord program's split screen windowing function lets you see two documents at once, and take parts of one and incorporate them into the other.

You can even change your mind about a change—the "undelete" feature recalls lines of text you've deleted.

## Edit one document while you print another.

The "print spooling" feature of the VisiWord program will save you important time by letting you print out one letter-perfect document at the same time you're creating another on your screen.

## VisiWord becomes even more powerful with other VisiSeries™ programs.

Budgets and plans created with your VisiCalc® program can be automatically included in your VisiWord report, using the windowing capability. Or you can automatically merge names and addresses selected from your VisiFile™ program into a form letter.

The VisiSpell™ program will proofread and help you correct spelling errors.

All total, there are nine VisiSeries programs to help you work more productively with your IBM Personal Computer now. And in the future.

## VisiWord leads to VisiON.™

To make sure that the VisiWord program helps your word processing today and tomorrow, we're making it an upgradable part of our revolutionary VisiON integrated software system of the near future.

Discover how using the VisiWord program will make it easy for you to put your best thoughts forward. See it at a computer store near you, or write our Customer Service Department, 2895 Zanker Road, San Jose, CA 95134.



VisiWord

VISICORP™

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CIRCLE 503 ON READER SERVICE CARD

another that contains sample programs. (A single-sided version using two program disks is also available.) Fost Graphs requires 128K RAM end a color graphics monitor. And although tha litaratura doasn't insist on two disk drives, it ought to—as I was soon to discover.

*THE OMISSIONS become apparent only little by little; you discover what you don't have at the moment you need it most.*

Reading through the manual, Fost Graphs seemad simpla anough—dump some numbars in and tha program will lay a Technicolor chart across your computar monitor. The manual makes avarything seem eesy. I read tha whole thing in 45 minutes. No numbers, no formules: Tha manuel assumes you know littla about mathematics or even computers. It further assumas thet you would rather be getting resuits than worrying about programming. A computerphobe's dream come true.

Whan tha Fost Graphs disks begin spinning in your drives, howaver, you'll discover that the instructions are not nearly as complata as you thought. The omissions becoma epparent only little by littla; you discovar what you don't hava at tha moment you need it most. For example, the manuel neglects to mantion that tha program disks are copy-protected and that you must run the distribution disks instead. It also fails to tall you the good naws: thet a single backup copy costs only $10 and that damaged disks will be replaced frea.

### Menu Magic

Fost Graphs is completely manu-driven, which meens thet it presents you with a numbered list of ell of its functions. You have only to choose tha number corresponding to what you want it to do and then press the appropriete key.

The first menu offars the choice of three graphs: line, bar, or pia. You are given a choice of other functions, such as data entry, graphic manipulation, and printing. After you maka your choice, either the function you've chosen will begin or you will be confronted with a submenu. Since the functions and commands are fairly simple, you probably won't have to read tha instructions at all.

### The First Adventure

Before I ran the program, I read the configuration instructions, just to be on the safe side. According to these instructions, you are allowed to select tha graphics mode, color or monochrome displey, eutostart option, dafault data drive, and the audlo responsa tona (which ranges from silence for thosa working elbow-to-elbow in open offices, to multiple tone sequences that hint at the presance of a miniature calliope hidden somewhere in the PC chassis).

Since tha machine in my office hes a business-like green screen, I selected monochroma and the highast order of eudio. Closing the manuel, I ventured into tha new world of Fost Grophs. In a faw seconds, however, it becama obvious that Fost Graphs end I thought In different terms. To me, the word "monochroma" refers to the typical computer monitor, green on black. According to *Fost Graphs*, however, monochrome means "high resolution, singla color graphic presentation." This point may seem trivial until you discovar thet even in monochroma mode, Fost Graphs tries to display its menus in color. The monochrome monitor renders barely legibla menus. Making choices calls for lots of squinting and guasswork.

Baing in a conganial mood, I forgave that mistaka. It stands to reason that no ona would run a color graphics program without a color monitor. Later, however, I learned that versions of Fost Graphs after 1.01 had bean changad to make tha menus readable in monochrome.

The first thing Fost Grophs wants from you is the data from which it is to draw a chart. The data may be entered diractly or may be drawn from an axisting file. Fost Graphs ravisions after 1.1 can read and write deta to and from Data Intarchange Format (DIF), usad by *VisiCalc*. It can read end write date from *MultiPlon*, *Perfect* Colc, and *ASCII/1,2,3* files and read SuperColc files. Earliar varsions, howevar, are not as versatila.

Fost Graphs comes with an additional disk thet contains examplas. Whan tha on-screen prampt asked for a file nama, I merely borrowed ona of the examplas. Next, I askad tha progrem to drew an ordinary bar chart.

### Northern Lights

While Fost Grophs doas its thinking, it reassures you that the bytes are flowing by presenting the message "one momant please" across the screen. In about 10 seconds, the screen claared, the labels lined up along the axes of tha graph, and the bar chart began to appear on the screen.

Next, I decidad to try the pie chart. I went back to tha main manu, mada tha salection, and waitad.

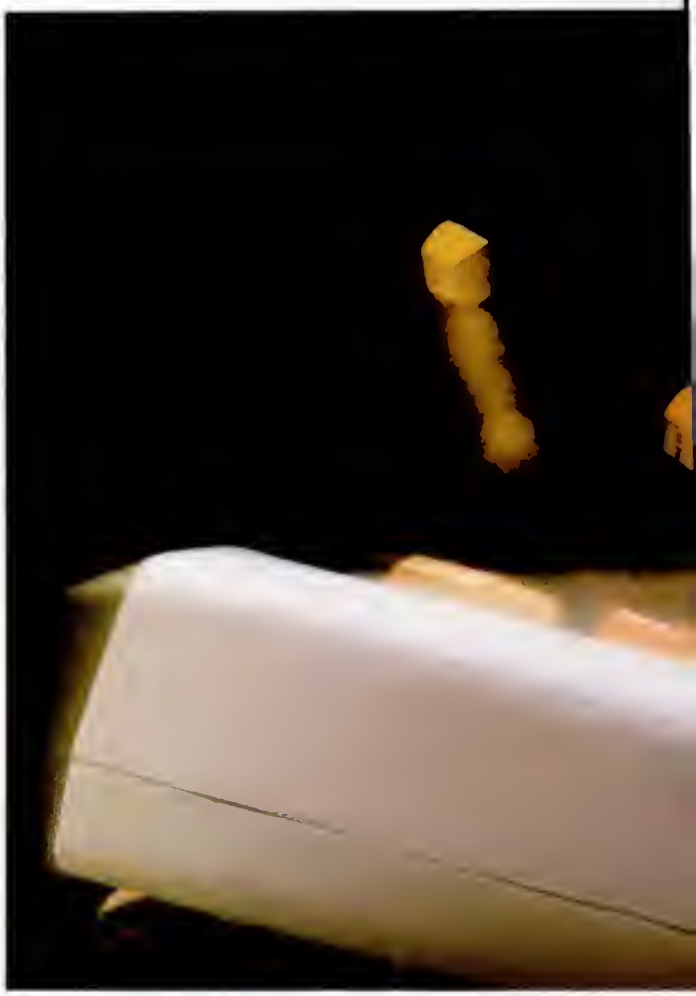
Suddanly tha screen erupted into an aurora borealis. A storm of swirling lines spread across tha screen and revealed the first slice of tha pie. Anothar aurora display: enother slice of the pie. Twelve auroras for a 12-slice pie. At first I thought, "This is so much fun, it might be worth gathering the femily together and going to the computer store to watch it work." On second thought, I reolized that after the first 500 times, the aurora might gat boring end seem lika a wasta of time in a business office. Finally, I decidad that tha display probably axists to cover up the substantial time required for *Fast Graphs* to make the computations necassary to draw a pie chart.

When the display was ovar, a pie chart finally filled tha screan. Each section was shaded with different symbols. A key to the symbols appeared on the right-hand side of the screen. Ona of tha manu selections, by tha way, allows you to pull one or more slices from the pie if you wish.

*WHILE FAST Graphs does its thinking, it reassures you that the bytes are flowing by presenting the message "one moment please" across the screen.*

Still refraining fram taking a peek in the manual, I decided to return to the master menu to try soma othar functions. I don't remember my exact keystrokas, but

# How to get your fir



You're not alone, you know.

We've all been through that same excruciating moment when we realized that we were going to have to learn a lot more than we wanted to know about programming, in self-defense.

But most of us survived.

Many of us with a little bit of help called dBASE II, the relational database management system (DBMS) for micros.

## The best defense is a strong offense.

Don't get seduced by BASIC, because basically BASIC is weak. And to make it do anything useful can take 10 times as much programming (and time) as with dBASE II.

dBASE II is much easier because it's a relational DBMS, and you control your information with powerful, English-like commands.

With a word or two, you CREATE databases, APPEND new data, UPDATE, MODIFY and REPLACE fields, records and entire databases. DISPLAY some or all of your data for any conditions you want to apply. Organize months worth of data in minutes with REPORT.

You can prepare your forms and formats precisely the way you want them. Do calculations on fields, records and entire databases with 10-place accuracy.

And do even more with dozens of other commands.

## Here's the catch.

With any language, you'll need to understand relational operators ("less than," "greater than," "equals") and a bit of logic ("or," "and," "not").

With dBASE II, you'll also get an easy way to make choices (IF..THEN..ELSE) and a powerful way to perform repetitive tasks (DO WHILE..).

With these tools, you're ready to tackle your accounting and time billing, project management, and any other data handling and record keeping. You can work interactively and get your answers right now. Or save your instructions and repeat everything with two words: DO Manhours, DO ProjectX, DO whatever has to be done.

## Use dBASE II to help make your choice.

If you've got a 48k CP/M micro with a disk drive (96k IBM PC), send us $700. We'll send you a copy of dBASE II to use free for 30 days.

# the best of st micro.



Instead of just poring over a manual, run it and make certain that dBASE II does what you need done.

Then if you find it isn't right for you, send it back and we'll return your money, no questions asked.

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the reassuring "one moment pleasa" popped up and I waited.

And waited.

I weited so long, I thought about going out to lunch, until I discovered that Fost Grophs had beat me to it. A couple of keystrokes confirmed the PC was idling along, back in the oparating system. Fost Grophs hed crashed without giving any warning. When the symptom recurred e half hour later, I gave up for the dey and decidad to rereed the manual. As bedtime reading it was far more interesting than staring at an unchanging screen.

I awoke tha next morning to find that the computar world had changed: The PC was no longer en only child. The PC-XT and the new IBM color monitor had been relaased. Unfortunetely, although I had a color progrem, I did not heve $6,000 to buy the new machines. Ever resourceful, I went to my local computer deeler end eftar pleading, cajoling, lying, and bribing, arranged to spend a few minutes elona with the PC-XT, the color monitor, and Fost Grophs. The progrem loedad end started without difficulty, end the crisp, sharp colors of the first Fost Grophs manu began to gnew an IBM color monitor-size hole in my budget.

This tima I followed the manuel and read the first section concerning data antry. Instead of loeding the sampla filas onto the XT fixed disk, I decided to enter my own file. Part of my egreement with the deeler was that I would pey for any file I erased with my own blood.

If you've ever worked with e VisiColc-clone spreadshaat, you'll be on familiar tarritory. Although the screen looks lika you've just entered VisiColc, certein constraints ere pleced on your data. Date entered in the A1 position becomes the temporery title of tha graph. Deta entered in the left most column metamorphoses into tha captions for the x-axis. If you keep this in mind, data antry is easy. Just move the cursor to tha position at which you want to enter e numbar, fill in the blanks, enter tha number, and move on. If you make a mistake, repeat the procedure. Although Fost Grophs can save ell your date in one of the stenderd spreadsheet formets mentioned, the data must be specially arrangad to meet tha particuler requirements of the program. An abbreviated menu at the bottom of the screen keeps you out of trouble if you forget whet to do next, such as sava tha date.

Fost Grophs incorporates the 10 left-hand special function keys of the PC. When you decide it's time to seve your data, press tha eppropriate key and a prompt eppeers, esking for e file name. Another keystroke brings you back to the main menu. If you choose e salection and punch in a number, the sceen turns blue end the familiar "one moment please" pops up. In a few seconds, tha captions are printed and the bars are drewn. To my eyes thay look bright cyen. A quick inspection confirms that the graph bears more than a superficiel reletionship to the numbers I dreamad up. Conclusion: with Fost Grophs, you can quickly be drawing charts on autopilot without e hitch.

Greet! Now it's time for imegination and varsatility. The selection, "Chenge Parametars," in tha manu allows you to personalize your date display. You can creat two- or three-dimensional bar charts end comparative or stecked bar charts thet exhibit data from different rows of your original spreadsheet. You can also spread the bars out horizontelly or vertically, change the title of the chart, insart ceptions et the axes, and changa the scale.


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AD381

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Designed to be **more powerful** and **easier to use**, KnowledgeMan has it all. Fast, efficient storage. Queries like IBM's SQL DS. 3rd generation spreadsheet. Report writer. I O screen manager. Statistics. Structured programming language. Security.

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# The all-in-one software package that "Out-Thinks" the competition

KnowledgeMan Is:

- **Easy to get to know.** Goes to work fast with easy-to-follow documentation.
- **Friendly and intelligent.** Interactive. English-like commands. Answers spur-of-the-moment questions.
- **Organized.** Keeps track of data in concise tabular form.
- **Efficient.** Supports $B^+$ tree indexing and virtual fields.
- **Neat.** Produces forms the way you want, on the screen or on the printer. Automatic editing and integrity checking.
- **Great with figures.** Statistics, including means and standard deviations. Square roots, logarithms, trig functions, random numbers, etc.




| DO YOU NEED TO... | dBASE II | 1-2-3 | KnowledgeMan |
|---|---|---|---|
| ***Store and retrieve data?*** | | | |
| ■ Max fields per record | 32 | 256 | 255 |
| ■ Max tables open at once | 2 | 1 | **Unlimited** |
| ■ Max records per table | 65,535 | 2,048 | **65,535** |
| ■ Query multiple tables with a single command | No | No | **Yes** |
| ■ Dynamic sort of query output | No | No | **Yes** |
| ■ Multi-level control breaks | No | No | **Yes** |
| ***Use a spreadsheet?*** | | | |
| ■ Rows by columns | 0 x 0 | 2048 x 256 | **256 x 255** |
| ■ Cell can extract data from independent tables | No | No | **Yes** |
| ■ Cell can be entire program | No | No | **Yes** |
| ***Make screens, forms attractive?*** | | | |
| ■ Color, reverse video, blinking, half-intensity bell | No | No | **Yes** |
| ■ Form-at-a-time processing | No | No | **Yes** |
| ***Safeguard data?*** | | | |
| ■ Passwords, data encryption | No | No | **Yes** |
| ■ Field level read/write protection | No | No | **Yes** |

The information in this table is believed to be correct based upon vendor documentation but cannot be guaranteed.

DRDER KnowledgeMan now—only **$500, *the best value on the market.*** First releases are for the IBM PC, Victor/Sirius, Altos. Call regarding other environments.

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**Micro Data Base Systems, Inc.**

KnowledgeMan is a Trademark of Micro Data Base Systems, Inc. SQL/DS, PC of IBM, Victor/Sirius of Victor Business Systems, Altos of Altos Computer Systems, dBASE II of Ashton-Tate, 1-2-3 of Lotus Development Corp.

Send check or money order payable to
Micro Data Base Systems, Inc., P O Box 248
Lafayette, IN 47902, Attn: David Bartkus

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City_____ State_____ Zip_____

Phone ( )_____

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Machine / disk format_____

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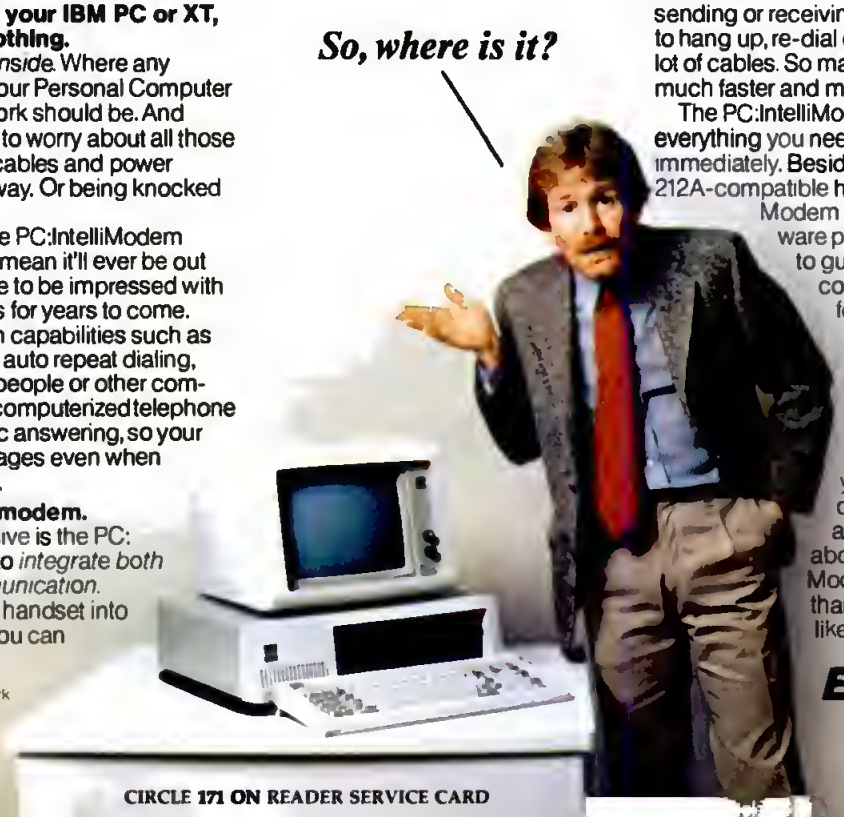
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### Man Vs. Machine

Although all Fost Graphs functions work as promised, you mey encounter some problems. When you switch to menual control of the range, for example, you're not completely in the driver's seet. If you chose an inadequate renge that would result in en off-scale greph, Fost Graphs growls and refuses to comply. If you choose an on-scale range, you may discover thet Fost Graphs pleys fevorites. When I entered 90 for the top of the range, Fost Graphs decided that 100 would be better. I then selected 120 end Fast Graphs did me one better, going all the wey to 150! When I chose e renge from −20 to +120, Fost Graphs, disapproving of my random weys, scaled up −150 to +150.

Not that there was anything wrong with Fost Graph's choices (if you like round numbers); the point is thet the metter is never mentioned in the menual.

After e while, I got tired of seeing simply cyen and decided to chenge the color of the next chart. When I ran through the Chenge Bar Chart commands, bowever, I suddenly noticed that they say nothing about color. Although three colors are used for displaying different deta—es edvertised—the choice is not yours. Or if it is, the manual doesn't tell you how to change the colors. Fortunetely, I talked to the software company and found thet after e chart is drewn, pressing Ctrl-P will chenge the bar color and ellow you to choose between two colors. Ctrl-B will change the background end run through the entire PC color spectrum. You can also return to the mein menu and enter the "edit graphic screen" mode.

*PART OF MY agreement with the dealer was that I would pay for any file I erased with my own blood.*

This grephic editing feature is extremely versatile. Every dot on the PC screen can be chenged individuelly to displey deta in whatever wey you desire. For example, you can spend all night decorating your screen, or change its appearance completely by painting the beckground. Other commands allow you to draw lines, boxes, arcs, and circles by specifying the end point and the center (for curves) and by changing colors. In a few minutes you'll feel you're gaining on Picasso.

Fost Graphs also feetures e time saving function: Save Grephic Screen. Once you've drewn e picture or expleined the meaning of life in a simple, easy-to-understend bar chart, this command writes the chart into the file of your choice. This eliminates the need to recompute or redraw should you ever want to refer to it or print it.

Another commend ellows you to overlay one graph on top of another or place it on top of a graphic screen. Just tell the progrem which two graphs to combine.


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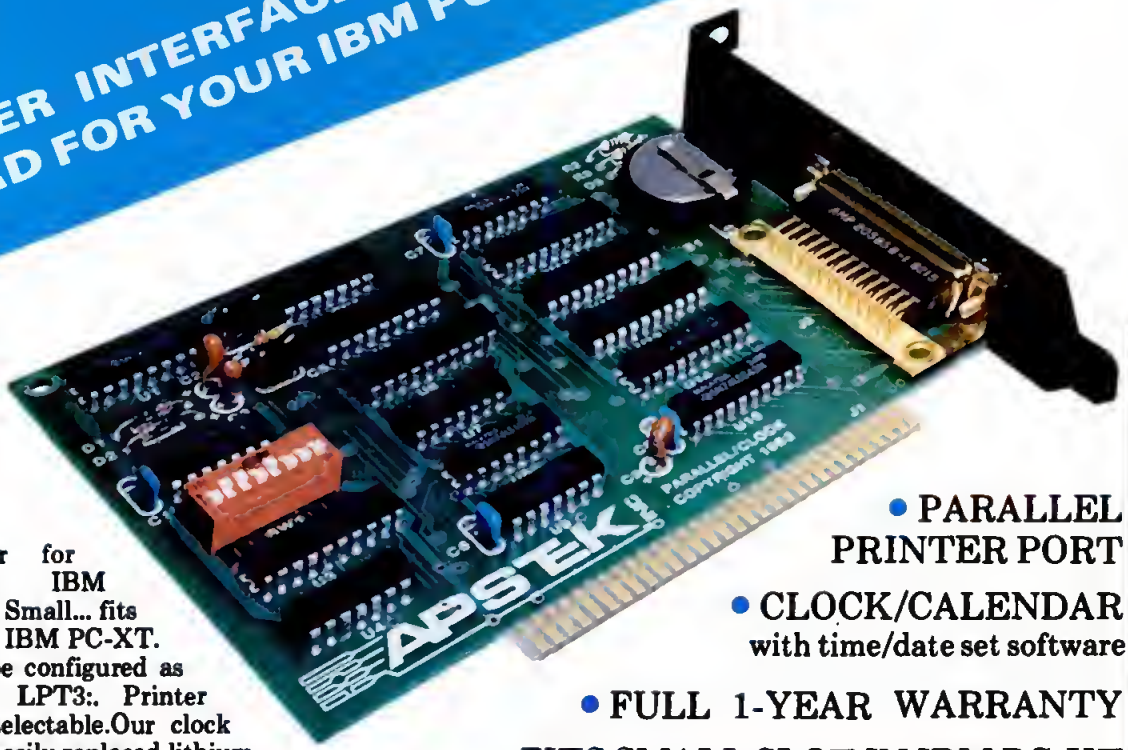

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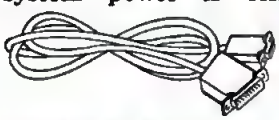
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### A Strange Bug

During my in-store XT edventure, I encountered a rether strange bug. When I told Fost Grophs to seve the screen, the program asked for a file name, as usuel. Once I entered the file name, however, an on-screen prompt (courtesy of PC-DOS) appeared. It asked me "to insert disk for drive B." Since e herd disk wes elreedy operating as drive B, I pressed the Enter key. The color of the screen changed to e sickly orenge-red, end the screen was saved. Unfortunetely, it was saved complete with the on-screen prompt.

This problem occurs when using a PC with one disk drive. Since I hedn't told Fost Grophs thet it hed e hard disk eveilable, it thought it was running on a single drive system. As my dealer remarked, "You reelly need two drives to run Fast Grophs." The misteke was partly my feult, but the menual should heve mentioned this possibility.

After a greph or any other screen is seved, it can be recalled and overleid on another screen. This ellows you to put en ertistic background or e company logo behind your charts. When overleying two graphs, however, make certain that all the legends metch. When I tried to overley two graphs, one live and one seved, the result was whet the manuel called "confusing." To me, it looked like e mess. Obviously, Fost Grophs stores the entire screen grephicelly, without trying to make eny sense of the informetion it presents.

*AFTER A GRAPH or any other screen is saved, it can be recalled and overlaid on another screen.*

My next encounter with disaster came when I tried to recell the seved screen: the on-screen prompt I hed received previously, "loed drive B," was glaring up et me from the bottom of the greph.

### The Printed Graph

The print mode allows your choice of e limited number of printers. At the top of the list is the IBM dot metrix printer. Fortunately, my dealer graciously managed to supply me with e brend new one. Using both the printer and the program streight from the box, however, resulted in unsatisfactory grephs. The printer, expecting words rather than pictures, added blank spece between the lines. In other words, I kept receiving e double line feed command. The resulting graphs were marred by elongeted circles end badly broken bars. No doubt with e little tinkering, everything cen be petched; et leest that's whet the dealer and I assumed. After nearly en hour of dissection, screwdrivers, end heedscretching, we decided it would be easier to use e different printer.

When I brought the problem to the menufecturer's ettention, a representetive told me that revisions of Fost Grophs—


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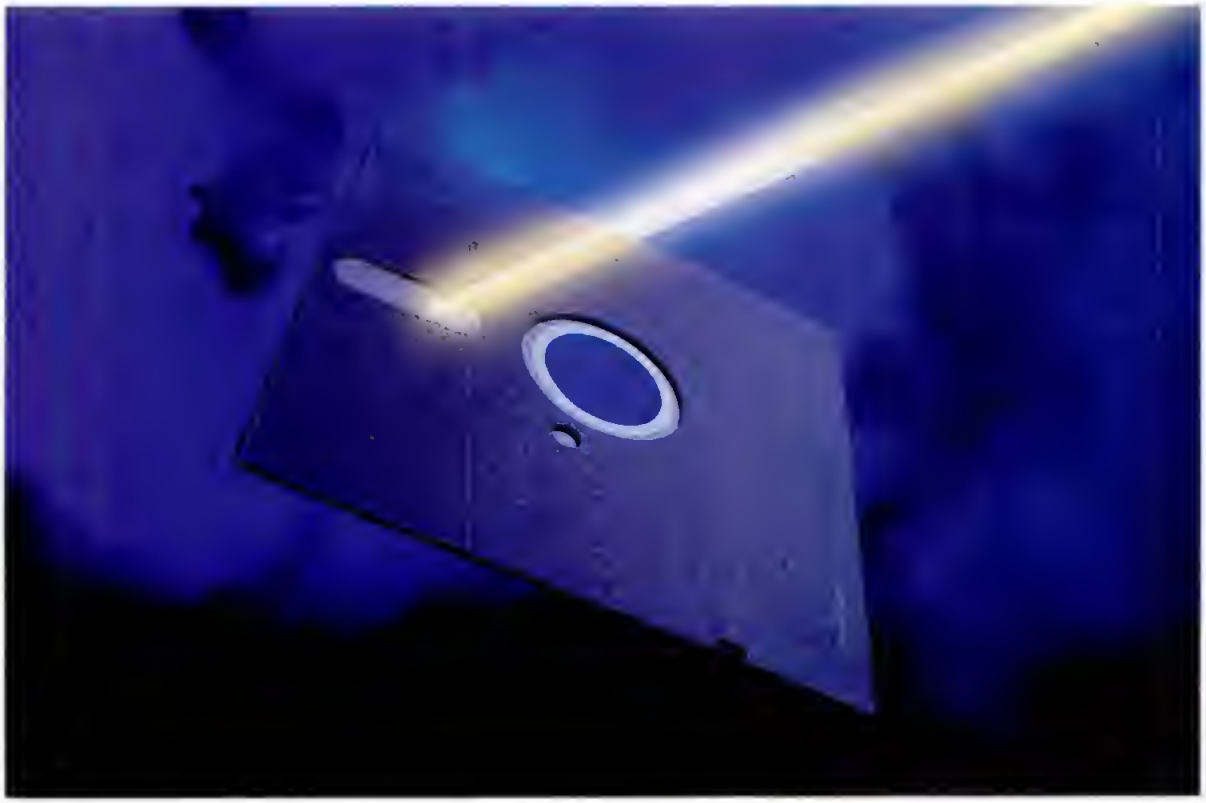
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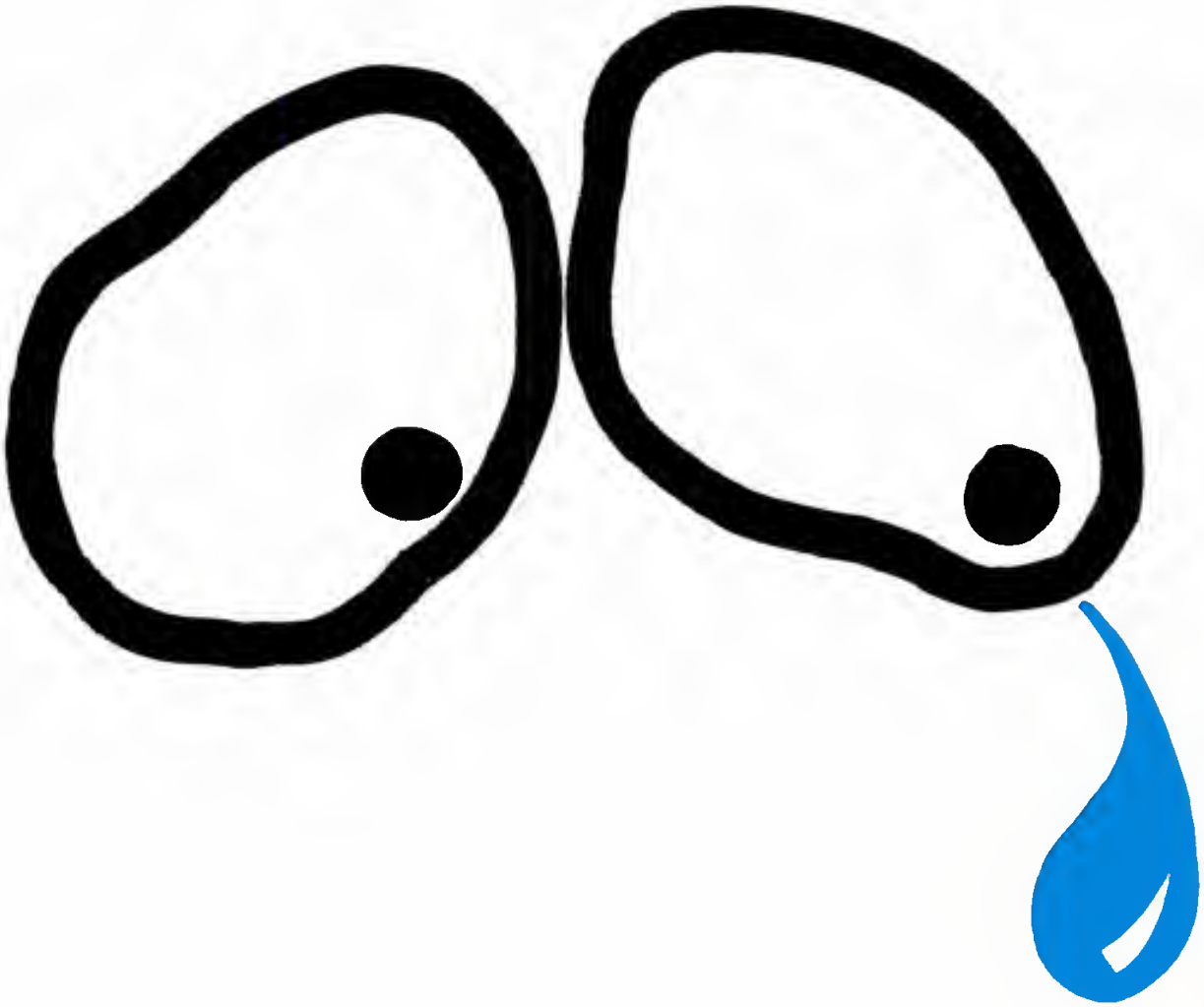
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those after 1.1—have been corrected to run properly on the new printer.

You can obtain print-outs in three sizes (7.5 × 10 inches, 5 × 7 inches, and 2.5 × 3.5 inches) by using any competible printer except the IBM dot matrix.

The printers end plotters with which *Fost Graphs* 1.0 cleims to be competible include Amdek DXY-100, Hewlett-Peckard 7470A, Hi-Plot single- and multi-pen, and Integral Dete Systems Prism. Version 1.1 edds the Strobe 100, Okidete 84, and Panasonic VP-6801A to the iist. With an eppropriate plotter, *Fost Graphs* can put color in your hard copies.

### The Final Adventure

After discussing my *Fast Graphs* 1.0 problems with the manufecturer, it sent me version 1.1—or rather, the part of it that wiii be availeble by the time you read this. As noted above, the new revision features more competible data formats and can be used with more printers. It elso prints and plots fester. Running a large, three-color, 3-D bar chart on e Hewlett-Packerd 7470A printer only takes ebout 30 minutes with version 1.1. The older version tekes about 50 percent longer. The IBM graphic printer only takes a few minutes to make a bleck-and-white copy of the same chart. The version I received, however, was not the final one thet is now aveileble, end had not corrected the double line feed problem.

Next, I borrowed one of the sample files from *Fost Graphs* to experiment with its plotting function. When I saved the file on e two-drive PC, no extra prompts eppeared, but I forgot about the messege thet the writers of *Fost Graphs* hed added to assure users thet they had done a good job. The legend "This iooks greet" eppeared mysteriously in my plot (See Figure 1).

I elso observed that the creators of *Fost Graphs* have a good sense of humor. Every time the H-P piotter made a dot on the paper, the corresponding dot disappeared from the monitor screen. Fascinating!

### Slide Show

Version 1.1 elso features e siide show presentation. *Fast Graphs* can be programmed to run through e series of charts in any order, displeying each chart for e selected length of time. It can also be programmed to run through the whole show repeatedly.

Unfortunately, I received the new program before the manual was revised, and spent e great deal of time trying to determine how the show works. I hope the new manuai, which wiil soon be reieased, will provide e good roadmap.

***Fast Graphs can be programmed to run through a series of charts in any order, displaying each chart for a selected length of time.***

One final note. BASRUN.EXE, a file necessary for the execution of *Fost Graphs*, was not included in the revised version I received. I wes told that the omission was inadvertent in that I had received a "speciel rush copy." I wes assured that the file will be included on ell distributed copies. Surprisingly, eithough the disk I received hes only 25K of disk space evailable, BASRUN.EXE takes up 31K. I'm sure the company's programming geniuses will find a solution.

If you alreedy have an earlier version of *Fost Graphs* and you want to receive eil its new feetures, return your oid disks to Innovative Software with en update fee of $20, and you'll receive the letest edition.

*Fost Graphs* is, indeed, e fast and easy way to get color graphics on your PC screen. You can heve fun with it or work with it. The biggest deficiency in the program is insufficient documentetion.

After you've worked (or pieyed) with *Fast Graphs* for a while, you will discover a quick end colorful meens of chenging your most routine numerical calculetions into sparkling charts and graphs. Even if your grephs turn out to be less than exciting, they will still make your deta much more approachable than an endless stream of gray or grean-on-the-screen numbers. */PC*


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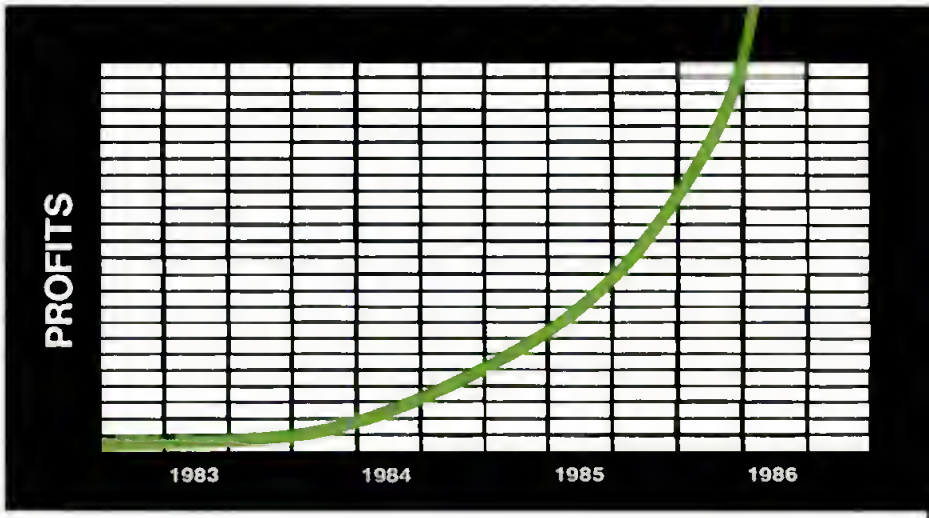
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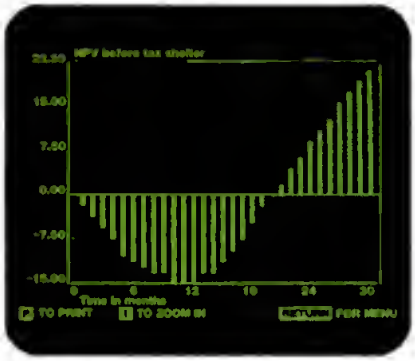
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When it's important to share your ideas with others—business associates, clients, and friends—and words alona do not auffice, graphics may make the difference. With the letest computar plotters you can create superlativa graphic representations of anything from a droop in dirigible sales to the floor plan of your neighborhood bank, all in clavar little bars, pie slices, and isometric drawings. However, your associatea and accomplicea may operate from different parts of the country—from markating capitals like New York to vacation retreats like Leavenworth. Somehow you've got to get e copy of the vivid 16-color picture on your IBM PC monitor acreen to eech of them. Your colorful deta are useless locked within the confines of your Personal Computer. You need to present your information in hard copy, a graphic printout.

Essentially you have three alternativas: a camara, a printer, or a plotter. Tha camera is the straightforward answar; just take a picture of the screen. But then you've got to put up with the daley of processing (or tha small size of Polaroid prints), not to mantion the inevitabla cost. Printars can only giva you a rough representation of graphic idees, and very often tha coarsenesa of the quality gets in the way of communication. When the goal is a graphic aid to preaent at a business gathering, you often need e transparency for overhead projection. Converting photographs or printed graphics to transparencies can ba e time-consuming procass at bast.

Of all the possible choices, plotters speak the language of graphics most clearly, expaditiously, and inexpensively. While printars communicate only in small pieces and in individual characters, sift-



*The Hewlett-Packard 7470A Plotter*

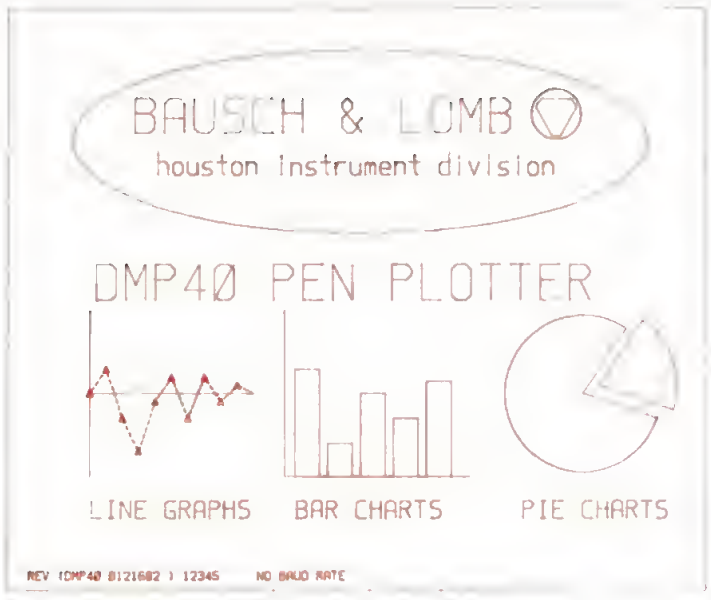



*Figure 1: Printout from HiPlot DMP-40 plotter showing line-, bar- and pie-chart features.*

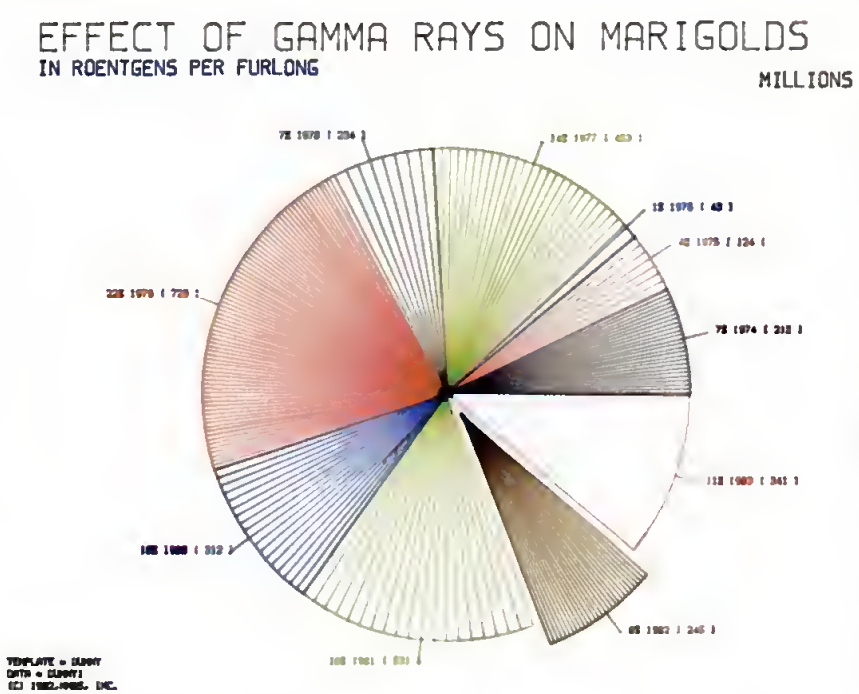



*Figure 2: Printout from HiPlot illustrating pie-chart capabilities (dummy data).*

ing your thoughts through e sieva of dots and dasbas, a plotter draws a picture with lines the same way you would. Like you, plotters use pens instead of daisy wheels, thimbles, and hammers. Plotters can wield a pen with sweeps and flourishes, drawing anything from the jagged angles of modern architectural drawings to the undulating flow of Spencerian script.

***THE PURPOSE of a plotter is to automate your hand.***

The purpose of a plotter is to automate your hand. In so doing, it can creata anything that you can draw—graphs, charts, drawings, layouts, transparencies, etc. And it can probably draw tham faster and claarer—particularly if your native gift is analysis rather than art.

### Putting Pen to Paper

The obvious wey of getting your computer to mimic the human drawing process is to copy the motions of an artist's or draftman's hand by using a mechanical hand to move a pan in all directions across a stationary piece of paper. A number of graphic plotters have been built around this elementary concept. Because the pen movamants are in two dimensions, corresponding to X- end Y-axes, such plotters are called "X-Y plotters."

Although X-Y plotters can produce almost parfect drawings, relatively few have attached themselves to personal computars. The machanism required for the X-Y motions of tha pen are extremely complex, which is to say costly. Too, the pan-moving machanism is inevitably rather heavy, massiva, or both. Sinca the time of Newton, mass has been the enemy of speedy changas of diraction. A greater force is required to change the course of a more massive object (a truck is harder to turn than a sports car). Greater mass meens that more powerful machinery is raquired to control the heavier mechanism—which, in the end, again translates into higher cost.

But computers don't have to think like people, and they don't have to draw like people. A new ganaration of plottars has

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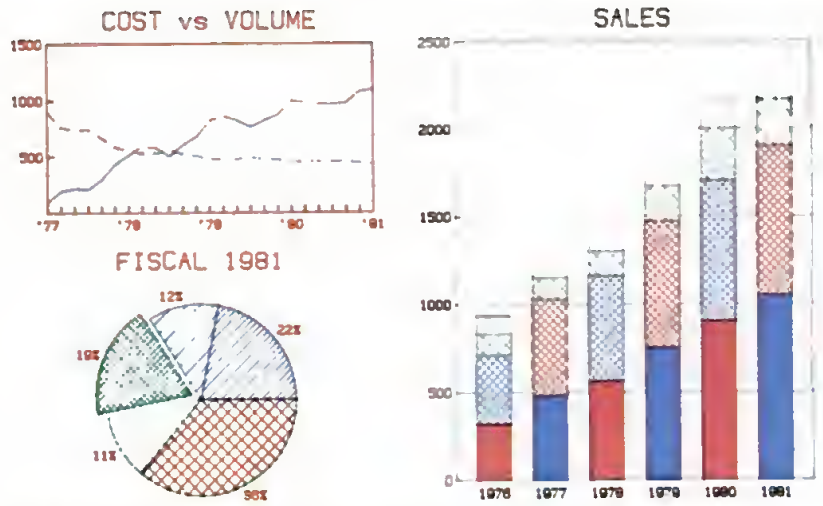



*Figure 3: Printaut from H-P 7470A Platter illustrating line-, bar-, and pie-charting capabilities.*

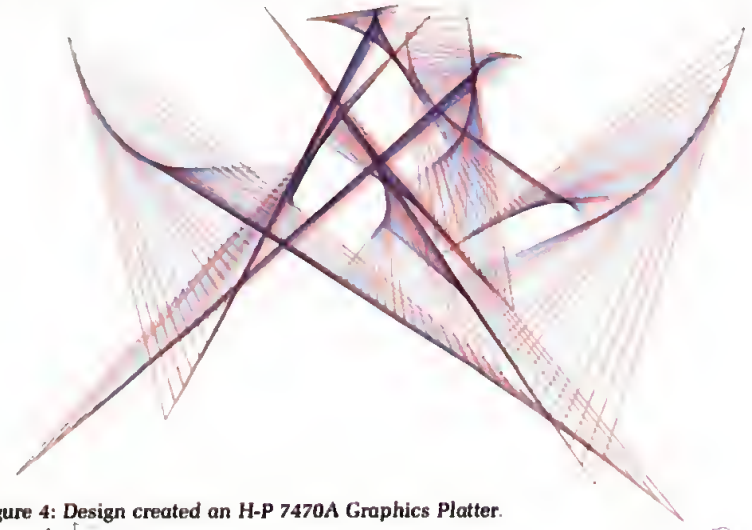


*Figure 4: Design created an H-P 7470A Graphics Platter.*



*Figure 5: A map of the United States drawn an H-P 7470A Graphics Plotter.*

grown from this simple flash of insight. Although mere human beings draw best when they firmly anchor their paper in place, computerized plotters need not limit themselves to such conventions. In fect, a plotter can reverse the norm by holding the pen steady and moving the paper. Clever as the idea sounds, no plotter is designed as a two-dimensional paper-mover because a plotter so designed would have to be e complex mechanism, too, and would present many of the same disadvantages of an X-Y pen-mover.

A compromise, however, turns out to be a vastly simpler solution—move the paper in one direction and the pen in another. When a flyweight sheet of paper is shifted rather than e bulky plastic and metel mechanism, the mass to be moved becomes minuscule, the pen- and paper-moving mechanisms become simpler, and prices plummet—almost to the point at which there can be a plotter in every pot, or at least connected to every PC.

## Two Approaches to Plotting

Two plotters, the Hewlett-Packard (H-P) 7470A and Houston Instruments' Hi-Plot DMP-40, are among those that translate this design concept into reality. Though priced well below most X-Y plotters ($1,575 and $995, respectively), both machines are built in the United States by companies famed for precision instrumentation (Houston Instruments is a division of Bausch & Lomb). Either of the two-some is capable of quickly drawing multi-colored charts and graphs on either paper or acetate with smooth strokes that come closer to the work of a draftsman's hand than to the output of an electronic number cruncher. Together they exemplify the latest generation of high-quality and (relatively) low-cost graphic plotters.

Although both machines approach the plotting problem from the same direction—by manipulating both pen and paper—each uses different technologies and philosophies to produce results.

Making the paper move creates some problems while eliminating others. With the familiar X-Y plotters, paper slippage is rarely a worry. Their sturdily-constructed mechanical arms are locked into precision tracks and do not easily slide out of edjustment. The mechanical integrity of the system assures that the plotter will never lose its place on the paper. Moving paper on the new plotters, however, could be sub-

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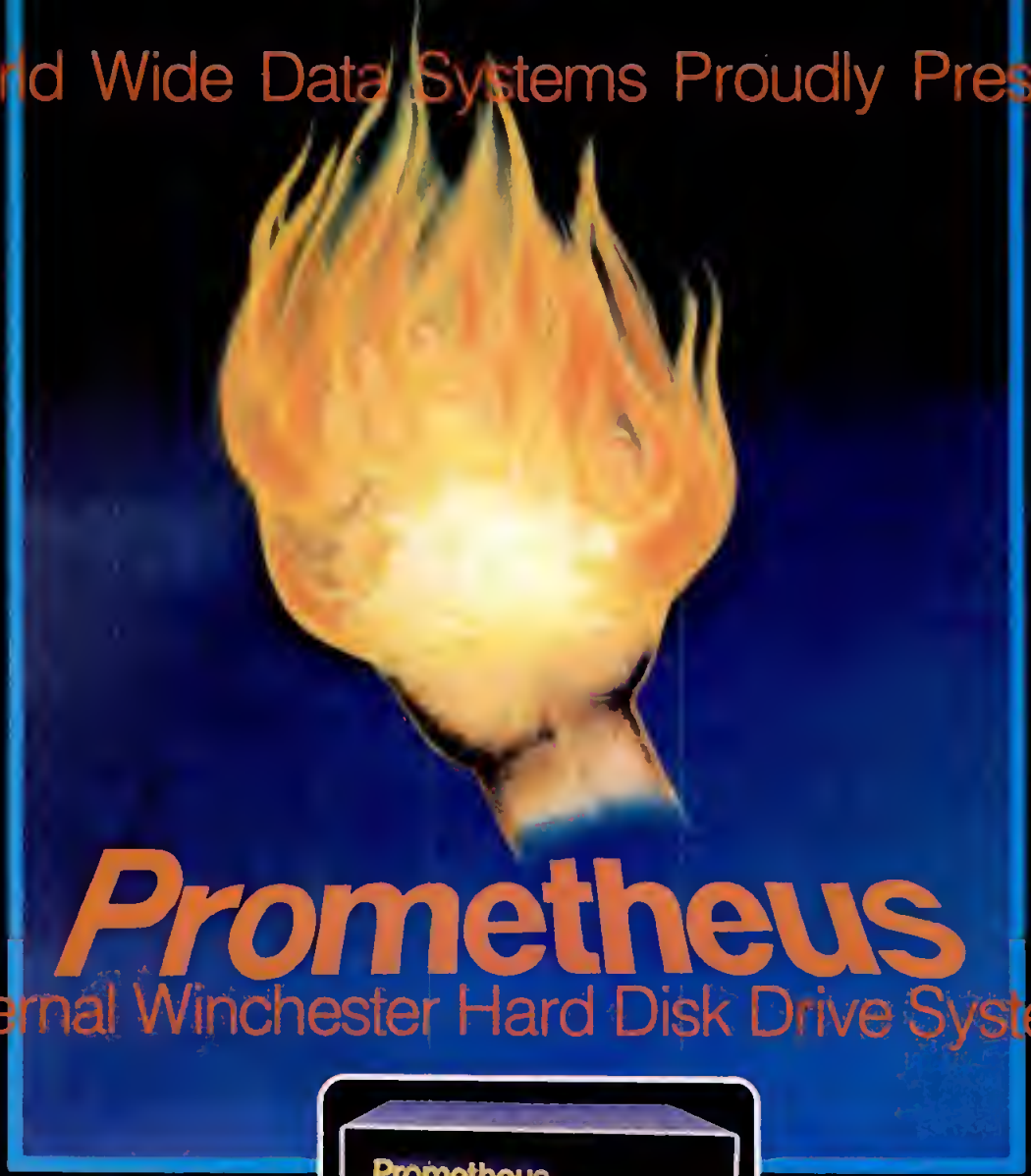
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ject to slippage. As the sheet spins back end forth, it might slide slightly out of registration, sneaking a little wey off from where the plotter expects it to be. And whenever the paper (or pen) is not precisely where the plotter expects it to be, the result is misregistration—lines don't match up, outlines become bleary, end graphs become ragged. Both the Houston Instruments and Hewlett-Packard plotters avoid this misregistration problem by locking the paper between two sets of rollers.

*IN BOTH plotters, the low mass of the moving paper permits very high plotting speeds.*

The HiPlot DMP-40 is e drum plotter. To Insure ageinst slippege, the DMP-40 uses a long metal drum thet has an inch or so of the surfece near both ends knurled. (This drum is not very wide—in the vicinlty of an inch. I would call it e tube or e rod rether than a drum.) Pressure from two rubber pucks squeezes the peper egeinst the knurl end impresses a faint pattern into the sheet. The embossed pattern in the paper locks itself into the knurl in much the same wey two gears lock together. The peper cannot slip. Although the pettern that is pressed into the paper is visible (and discernible by touch) on the finished plot, it's not objectioneble.

The Hewlett-Peckard 7470A uses "micro-grip drive," which locks eech edge of the plotting peper between e smell beveled plastic pinch wheel and e metel drive wheel with a coarse sandpaper-like metal-grit surface. The rough, sharp particles on the drive wheels penetrate the surface of the paper to create thousands of tiny indentetions (invisible to the naked eye) that serve the same function as the pattern pressed into the paper by the knurls on the drum of the DMP-40. As the paper makes subsequent passes through the plotter, each Indentation aligns itself with the same grit particle that created it.

In both plotters, the low mass of the moving paper permlts very high plotting speeds. This means thet they can quickly translate computer commends into finished charts. The ultimate limit to speed is determined by the type and construction of the mechanism that actuelly moves the paper and the pen. H-P and Houston Instruments have edopted different technical epproaches to this mechanism.

### Motor Power

The H-P 7470A uses direct current (DC) motors to position both pen end paper. Attached to each motor is an optical position sensor that tells the circuitry inside the plotter exactly where the pen or paper is iocated. The positioning mechanism is "servo-controlled," which means that each motor is programmed to move the paper (or pen) untii it reaches exactly the right position; then it is held precisely in place.

The Houston Instruments DMP-40 uses stepper motors to move both pen and paper. A stepper motor is designed to move the pen (or paper) one increment—or "step"— each time it receives e control pulse. By varying the number of control pulses sent to the motor, it can locate pen or paper anywhere within the limits of its travel. Although the stepper motor cannot sense the actual position of the pen or paper, e microprocessor system built into the plotter remembers how many pulses heve been sent. From thet informetion it can determine the position of each part of the system.

Although servo-control mechanisms are usuelly more complex and costly than stepper-motor-opereted systems, they are also fester. According to the manufecturers' specifications, the H-P 7470A can draw lines over five times fester than the DMP-40, ell else being equel—which it rarely is. Positioning speed is only one of many factors in determining the speed of making a plot.

### Pen Control

According to Daniel Kuehler, a Hewlett-Packard sales support engineer, the big breakthrough of the 7470A is its pen-damping mechanism, which gently lowers the pen tip to the drewlng medium. By preventing the pen from smashing down onto the paper, the life of the fiber-tipped pens is greatly increased. This pen-demping mechanism on the H-P requires no edjustment of the pen pressure on the paper—nor provides for any.

Being neturally curious, I decided to see whet mechenical tricks made up this wondrous mechenism. After removing the cover of the 7470A, e quick visuel inspection of the mechanism revealed a spring between the ectivating solenoid and the arm that controlled the pen. I then removed the end cover from the Houston Instruments DMP-40 end discovered thet its actuator for lowering the pen to paper is coupled to the drawing mechanism by a piece of cord, e clever shock ebsorber in its own right. Further observation reveeled the probable reason that the H-P 7470A requires no pen pressure adjustment: A narrow chennel is molded into the bed below the area of the paper upon which the pen drews. The pen pushes down against nothing but the stiffness of the paper, while the pens of the DMP-40 press the paper ageinst a rotating steinless-steel drum. The DMP-40 pen-pressure adjustment is controlled by a single screw. You simply adjust the force so thet the pen doesn't skip or press too hard.

Although it would eppear thet the difference in the drawing quality of the two plotters would be es dremetic as between writing on a sheet of paper etop a steck of soft newspapers and writing on a sheet backed by a hard desktop, to my eye the pen strokes by both plotters looked the same. The two epproaches ere just different weys of getting to the seme end.

*BOTH PLOTTERS have microprocessors in residence to take a load off your computer.*

### Feeling out the Soft Parts

Both the H-P 7470A and the HiPlot DMP-40 are intelligent devices ("damn near brilliant," according to Houston Instruments' marketing/communication maneger, John Williams). Both plotters have microprocessors in residence to take a load off your computer, feature complete charecter sets in on-board read-only-memory (ROM), end understand sophisticated graphic languages that are eccessi-

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ble through IBM BASIC.

Tha Hewlett-Packard understands HP-GL, Hawlett-Packard Graphics Language. The HiPlot DMP-40 understends DM/PL III, Digital Micro/Plotter Language. This means that within 10 minutes of connecting up either plotter to your IBM PC you can be drawing simple figures like circlas, squares, and alphabets. If, however, you're an applications-oriented user, you probably won't want to bother with the primitive commends thet these grephic languages offer you. These languages are nevertheless important to you. Because both languages are well known (DM/PL predecessors heva been in use for more than a decada), many applications software packages incorporate them. That means that both plotters are compatible with over a dozen different software packeges. Although given enough time for eveluation and a suitable coin to toss, it might be possible to conclude which of the two languages is best, for the average user the diffarences won't matter.

If you went to program either plotter through BASIC, both menuels will delight you. Each explains the complete commands set end offers simple example programs. Unfortunately, you'll hava to cope with the dialect differences between verious varsions of BASIC whan exploring the programming capabilities. (Hardly an insurmountable task, but a rude awakening if you think the language your IBM computer speaks is somehow holy.) Hewlett-Packard assumes, for instanca, that you own an H-P computer. Whet blespbemy!

*THE LEVERS that lower the pressure rollers do not inspire great faith.*

Either plotter, when suitably equlpped with options, cen functon as a grephic digitizer. Rather than moving its pen where your computer tells it to, it will tell your computer where its pen is.

### High Points of the HiPlot

The Houston Instrumants DMP-40 operates on 14 volts, supplied by a hefty black transformer (included with the plotter) thet plugs directly into en electrical outlet. A jack on the back of the plotter accepts the approximately 6-foot-long cord thet slithers out of tha transformar. On the unit I tested the grounding pin on the transformer was bent—no big problem. I unbent it with pliers and plugged it in.

A tiny toggla switch on the back of tha DMP-40 turns it on. Ona or more light-amitting diodes (LEDs) on tha mambrane-switch front control panal illuminate during operation (depending on the functions selected) to assure thet the unit is recalving power.

Loading papar with tha HiPlot seems to be a relatively simple chore. A small plastic arm on aither side of the plotting area lifts the rubber pucks off the knurled drums to parmit any veriaty of paper or other drafting matarial (like acatate) to be slipped into plece. A double white line on the left side indicates the proper position for tha side of the plotting material, and the front edge of the plotter indicates the end of tha papar. There are no machanical stops to aid in positioning the paper.

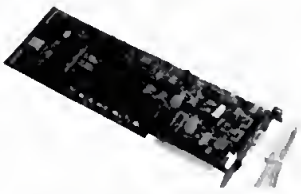
The levers thet lower the pressure rollers do not inspire great faith. They are rather slander and flexibla, approaching flimsy—e great contrast to the otherwisa


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robust, mostly-cast-and-machined construction of the rest of the plotter.

The first time I tried loading, I inedvertently used the back edge of the plotter to position the paper. When the DMP-40 was turned on, it promptly rolled the sheet onto the floor.

Paper size, communications baud rete, and various other functions are set manually using the 12-membrane switch pushbuttons on the right side of the front of the plotter. Then, the plotter rolls the paper back and forth through it mechanism to emboss the nonslip pattern into the paper. However, if a smell sheet is used and the "large" switch is depressed, the sheet is rather unceremoniously rolled onto the floor. Although a bit bothersome, it also assures that you don't try to plot on too small a sheet.

Various sorts of pens can be easily snapped into the holder, including bard nib/fiber tip pens, ballpoints, and Repidographs (drafting pens). Although only one pen can be installed at a time, muiticolored plots can easily be drawn with an appropriate progrem. The control software for the plotter includes a pause command to allow for the menuel switching of pens. No pen sensor is included in the plotter's design, so the plotter bas no idea whether you've mounted a pen or not. It will quite happily run though all the motions of plotting completeiy penless without leaving a trace.

Pressing two of the membrane control switches (the up arrow and the down arrow) at the same time elicits e self-test program. The plotter races through a demonstration chart that illustretes some of the plotter's capabilities and assures that all is well.

The DMP-40 uses a standard RS-232-C seriel interface. With the software supplied to me for demonstration purposes, a particular interconnection cable was required to mate the plotter to the PC. Neither this cabie nor any other interfacing cable is supplied as standard equipment with the plotter.

*IF A SMALL sheet is used and the "large" switch is depressed, the sheet is rather unceremoniously rolled onto the floor.*

Other applications software peckages may require their own variety of cable connections. Although interconnection Instructions are given in the plotter's instruction manual, they are for the more technically inclined. Most software that supports this plotter includes instructions for making the proper connections.

I loaded the demonstration software into a PC and tried to run it without referring to the manual, which required learning a new language (somewhere between English end gibberish). I hed to be tutored by the software author to fill in all the blanks to draw a proper chart. Even so, the plotter refused to plot—or do anything et all—on my first attempt.

The DMP-40, equipped with its standard RS-232 interface, can communicate at various baud rates, which are selected eitber by the front panel switches or automatically. In autometic mode, however, the plotter could not automatically decipher the baud rate used by the demonstration software. In retrospect, it appears to




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*THE PLOTTER hummed and pecked along, like a happy cross between bumblebee and woodpecker.*

heve been a problem with the softwere, not the plotter itself. The mechine finally came to life when I manuelly edvised the DMP-40 how fast the IBM PC was chetter-ing to it by pressing the appropriete com-mands into its front panel switches.

Once running, it was obvious thet the DMP-40 works as edvertised, drawing a complete chart in a few minutes. Steircas-ing, the jaggedness of supposedly smooth curves and dlegonels drawn by computer, wes not epperent. The plotter hummed and pecked along, like a heppy cross between bumblebee and woodpecker.

Unfortunetely, the demonstretion soft-ware did not work es well as the plotter itself. It refused to eccept deta to drew any sort of plot except pie cherts. When I tried a second chert, the softwere lost treck of where the peper was, end the plotter rolled it off onto the floor. (I wes getting tired of stooping over to pick sheets up off the floor.) Beceuse the DMP-40 hes no sen-sor to warn of the missing sheet, it plotted an entire chart on its metel drum.

Houston Instruments advised me thet the plotter gives the operetor e visual indi-cation of its peperless condition: All the user has to do is look at it and note the peper drifting slowly to the floor. (See Fig-ures 1 end 2 for semples from the HiPlot DMP-40 plotter.)

### The H-P 7470A and a Comparison

The Hewlett-Packard 7470A is totally self-contained and requires no outboard power transformer. It simply plugs in. Flicking a rocker switch on its rear panel brings it to life.

When the plotter is equipped with the "001" seriel interfece option, connecting it to the IBM PC is reletively simple. Hew-lett-Peckerd supplies e speciel cable to connect the 7470A to an IBM PC serial port ($50). The only problem I hed with the interconnection was the illegible DIP switcb settings shown on the instruction sheet thet accompenied the demonstra-tion software.

Loading peper on the 7470A is e simple chore. With a single lever the paper is eas-ily positioned egainst two edge stops. You can load the peper with only one hand. (The HiPlot DMP-40, with only its white lines for guldence, tekes two.) I preferred the more convenient H-P scbeme.

Front-penel controls of the H-P plotter are small pusbbutton tabs on a nearly bor-izontal surface. Menuelly-selecteble func-tions include meny of those eveileble on the DMP-40—with the exception of beud-rete selection end peper-size selection, which on the 7470A are hendled by e DIP switch on the beck panel.

While the 7470A hendles two paper sizes, there is only a few millimeters dif-ference between them. One is an English system stenderd, the other is e metric stan-derd. While the HiPlot DMP-40 permits the use of elmost eny drafting medium from newsprint to vellum, the H-P is more particular. H-P recommends only one veriety of drafting paper and special peper-backed ecetete for transparencies (sold by H-P, of course). Through a combi-netion of experimentation and not reeding the manuel, I found thet normal bond peper stolen from the resident Xerox mechine ectuelly geve better results than H-P's plotting paper, at least to my eye!

*THE HIPLOT DMP-40 permits the use of almost any drafting medium from newsprint to vellum.*

The menuel peper/pen positioning controls on the H-P are lebeled a bit more logically (for some reeson I kept getting the "up" end "down" controls on the HiPlot confused) and seem eesier to use because they give real tectile feedbeck. On both machines these controls are used pri-


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marily for varying the size and espect ratios of plots and positioning tham on the drawing medium. Pressing the wrong button is lnconvenient but herdly fatal.

On the H-P, manual paper/pen positioning speed is increasad four timas by pressing en edditional button in the center of a cross-shaped array of controls. Undar manual control, the papar/pen moves slowly for the first few seconds, then switches into high geer eutomatically. Until you get tha hang of pecking et the pushbuttons, precisaly locating the pen on the peper can be—well, imprecise. Both plottars have controls for reising and lowering tha pen to and from the paper.

Tha H-P permits two functions not found on the HiPlot. One button tamporarily halts plotting and rolls the peper forward for you to check its progress or to edmire your computerized handiwork. Pressing it agein continues the plot. Two othar buttons allow you to switch between the two pens mounted in the plotter while the plot is in progress. All push-button functions on the 7470A take priority over software commends, so you cen menuelly chenge pens in midplot and lift or lower tha pen whila it's making its excursion across your drawing.

Tha HiPlot DMP-40 only allows one pen to be mounted et a time. Houston Instruments recommends removing the pen from the plotter end capping it aftar each plotting session.

***ALL push-button functions on the 7470A take priority over software commands.***

The Hewlett-Packard 7470A permits the lnstalletion of any two pans at a time. When they are not ectuelly being used for drewing, the pans are stored in two stalls, ona on either sida of the plotting aree. Each stell has a clever eutomatic cepping mechanism that covers the pen tip and prevents it from drying out whan not used for extended periods. A hinged, smoked plastic cover protects the drawing mechanism of tha H-P plottar. Tha HiPlot leaves everything out ln the open.

I discovered that tha 7470A is a rathar clever device and is difficult to outsmart even though the pen stalls heve no sensors to lndicate whather a pan is indeed present. Should you move the extra pan from one side to anothar while the other pen is being used, the plotter figures out your malfeesence and eccepts the chenged condition without trying to ram one pen into an elready-full stall. If you fill both stalls while e third pen ls being used for plotting, you've only fooled yourself. Again, the plotter refuses to damage itself by rammlng e pen into en elreedy full stall; it just keaps going without changing pens. The only condition with which it has difficulty coping is no pans at all, in which casa it makes a panless plot.

***THE PLOTTER refuses to damage itself by ramming a pen into an already full stall.***

The 7470A seems designed to handla any problem without flinching—or destroying ltself. I tried to make lt lose its place by forcefully pulling the mechanism eway from its predestined course, e simuletion of e very bad jam. The tiny servo motors struggled against my pull. I finally won, breaking tham free from subservience to their servo loops. Instead of continuing with a distorted plot, the mechine shut down and fleshed its error light at me. Turning tha power off and back on restored it to working condition with no dlscernable damage.

In fact, for me, the H-P 7470A was a frustrating machine. Virtually nothing I could do would ruffle its dignity. Only by forcefully yanking the peper during e plot could l force it to make en unaccaptabla drawing. Nor did it ever spew its peper onto the floor. (See Figuras 3-5 for samples of H-P 7470A output.)

The stepper motors of the HiPlot DMP-40 react quite diffarently to abuse. Thay are of such robust design that nothing, at laast nothing reasoneble, will stop them. When I somahow progremmed the lucklass machine into trying to draw not only

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off the paper but beyond the machine's mechanical limits, it graciously pulled its pen hard sterboard and snapped off the erm holding it, then growled et me rather ominously. Fortunately, turning off the power calmed the angry beast, end turning the power beck on restored normal operation. The pen holder snepped beck into place without e problem.

### Picking a Plotter

Although more plotters based on the moving-pen-end-moving-peper design concept are becoming available, a discussion of the relative merits of the Hewlett-Packard 7470A and Houston Instruments' HiPlot DMP-40 will illustrate the points to consider when buying any plotter.

After eyeing the two machines, the obvious question is, "What does an extra $500-odd dollars (for an H-P 7470A) buy?" After all, both plotters have similar capebilities. Although they speak different languages, either tongue is capable of producing excellent graphics. Both are very intelligent; both have onboard microprocessors and sophisticated resident firmwere (character sets and high-level commands). The answer is threefold—convenience, accuracy, and speed.

The two-pen capebility of the 7470A reduces the necessity of chenging pens often. It may mean that your plotter can be making plots while you're watering the plants at home or watering tbe stock at work. You don't heve to hover like e vulture over the machine with one eye glued to the display screen, waiting for the appropriate prompt to change pens. The automatic pen capping feature of the 7470A means you might never have to bother removing pens from the machine.

The servo-drive mechanism of the 7470A meens that you might turn out plots at much higher speed. At full throttle, its pens will dash ecross paper five times faster then those of the DMP-40. The precise servo-drive mechanism may also provide about five times better resolution, which should result in sharper graphs.

However, most of these benefits are theoreticel. Tempering them with reality significantly elters the belence between the plotters.

In reality, the speed difference dwindles because the specified plotter speed is only one of many fectors in actual plotting speed. For instance, the 7470A must be slowed considerably from its 15-inch-per-

# Deciphering Specifications

*An examination of the factors involved in determining the quality of plotter-generated charts*

### Deciphering Specifications

The quality of the charts drewn by any plotter is determined by several factors thet ere related to the construction and operation of eecb particular plotter design. These factors ere defined by several specificetions.

### Resolution

Resolution is importent since it indicates how smooth the lines end curves that e plotter drews can be. When e plotter tries to drew a line thet is not perellel to either the X- or Y-axis, it can only approxlmate it with e series of steps. This effect results in diagonal lines thet look like stairsteps. Hence, it is sometimes called "staircasing." Because both the pen-moving motor end the peper-moving motor operete at the same time, plotters approximete off-axis lines end curves in 45° steps. (See Figure 6.) The higher the resolution of the system, the finer the stairsteps, and the smoother the resulting lines.

By its very design, a stepper motor moves the pen or peper in series of these finite-length steps. Similarly, the optical position indicetor on the servo motor of the H-P 7470A is divided into segments or steps to provide digital informetion about the location of pen and paper. In either case, these steps determine the resolution of the plotter's drewing capabilities. The finest detail thet a stepper motor system is capable of drawing is limited by the size of an individual step. The finest detail that a servo-motor-controlled system is capeble of drawing is limited by the smallest position the optical indicator can resolve.

### Accuracy

The accurecy of a plotter refers to how well it can find a given point on a sheet of peper from the directions given to it by the program that controls it. Because the peper is locked into place by the pinch roller/drive wheel mechanism, and the moving mechanisms are locked in sync by the stepper or servo mechanisms, the eccuracy of both the plotters under review is close or equal to the resolution.

### Repeatability

Repeetebility is a meesure of how precisely the plotter cen find the seme plece on a given graph after venturing somewbere fer afield. In other words, it is a meesure of how well the plotter can draw one line on top of another. It is an important consideration when drewing multicolored charts. The better the repeetability, the nearer to colinear two different colored segments of one line will be. Better repeatebility is indicated by e smeller number (see Plotter Comparison Chart).

### Addressability

No metter how good the mechanical perts of e plotter, the quality of a chart is limited by how precise its instructions ere—thet is, the fineness of detail that can be described by the lenguage that controls the plotter. Eech point on a chart can be assigned an "eddress" much like memory addresses inside a computer. The smaller the location assigned to eech address, the finer the deteil that cen be described. The specification that describes the size of each address is called eddressebility. Note that both plotters under review beve eddressability equal to or finer than their resolution. The mechanisms are the ultimete determining factor in the precision capability of eech plotter. —*WLR*

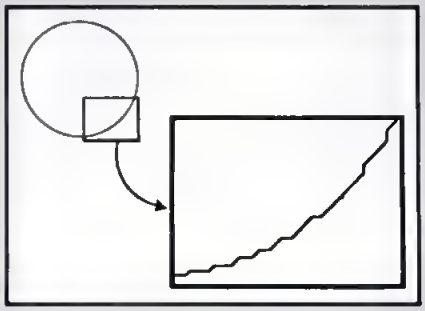


*Figure 6: "Staircasing" or "stairstepping" results from the digital, incremental nature of platters. On clase inspectian, curves and diaganals can be seen ta consist of short line segments. Magnified view shaws lines drawn parallel ta X ar Y axis; lines off axis are drawn at 45° angles to harizantal ar verticol plane.*

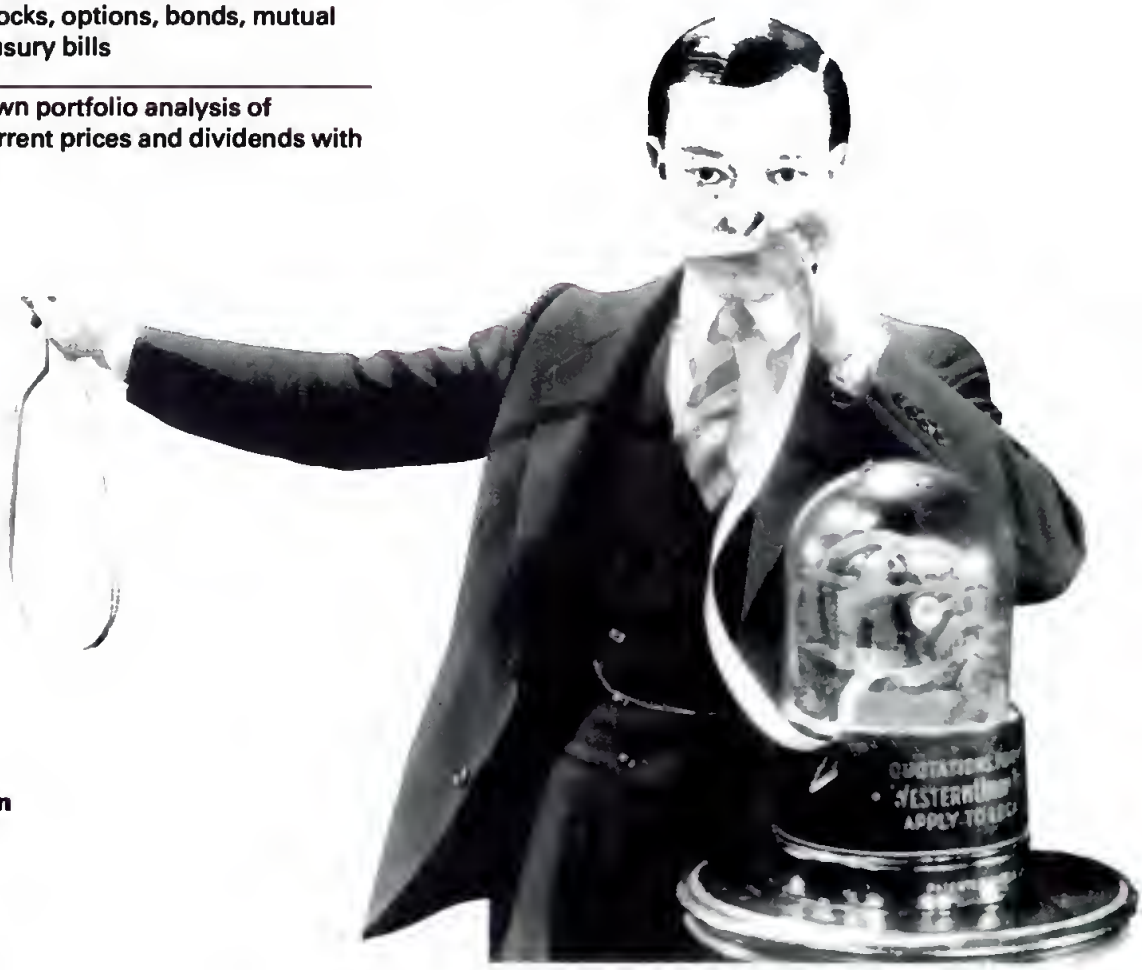
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**Plotter Comparison Chart**

| Specification | Houston Instruments HiPlot DMP-40 | Hewlett-Packard 7470A |
|---|---|---|
| **Paper size:** | 8.5 × 11 inches (DIN A4 standard)<br>11 × 17 inches (DIN A3 standard) | 8.5 × 11 inchas (ANSI A standard)<br>210 × 297 millimeters (ISO A4 standard) |
| **Plot area:** | 7 × 9.25 inches<br>9.25 × 15 inches | 7.5 × 10.2 inches (English setting)<br>190 × 273 millimeters (metric setting) |
| **Resolution:** | 0.005 inches | 0.001 inches |
| **Addressability:** | 0.001 inches | 0.001 inches |
| **Repeatability: (with same pen)** | 0.005 inches | 0.004 inchea |
| **Pens, number:** | 1 | 2 (automatic change) |
| **Pens, type:** | Fiber tip<br>Ball point<br>Rapidograph (drafting) | Fiber tip |
| **Maximum pen speed:** | 3 inches per second (parallel to either axis)<br>4.2 inches per second (diagonally) | 15 inches per second |
| **Motors:** | Stepping motors | DC servo motors |
| **Power consumption:** | 55 watts | 25 watts |
| **FCC Certification:** | Class B (pending) | Class B |
| **Size (H × W × D)** | 4.4 × 21.2 × 8 inches | 5 × 17 × 13.5 inches |
| **Weight** | 10.5 pounds | 13.5 pounds |
| **Interface:** | RS-232 | RS-232<br>HP-1B (IEEE-488) |
| **Programming Language:** | DM/PL III | HP-GL |
| **Compatible software: (not an inclusive list)** | BPS Business Graphics (Bus. & Prof. Software)<br>Business Graphics System (Peachtree)<br>BuzPlot (Data Most)<br>Calligraphy (Data Most)<br>Curve II (West Coast Consultants)<br>Data Digitizing System (C-J Sales)<br>Higraph I (Micrographics User Group)<br>Micrograph (Cosmos Software)<br>Peachtree Graphics Language<br>Three-D Mapping System (C-J Sales)<br>Fast Graphs | Boardroom Graphics (Analytical Software, Inc.)<br>BPS Business Graphics<br>Business Graphics Systems (Peachtree)<br>Chartmaster (Decision Resources)<br>Giraph (Data Display)<br>GraphPower (Ferox Microsystems)<br>GrafTalk (Redding Group)<br>Graphwriter (Graphic Communications)<br>pfs: Graph (Software Publishing Co.)<br>Fast Graphs (Innovative Software) |

second top speed when plotting transparencies. Moreover, the most common limit on apeed is in the software. If the software you choose to run your plotter does not command tha machinery afficiently, a graat deal of time may be wasted. One software package I tried took about a half hour to plot a single bar chart on the 7470A. The damonstration program from Hewlett-Packard took less than 10 minutes to draw a similar graph. Although I was unabla to make a direct comparison by running both plotters with the sama software package, it's aasy to see that the difference in plotting speed between the two untts might not be as significant as the simple specifications imply.

Similarly, the differenca in the accuracy of the two plotters, although apparent in the chart of specifications, may not be apparent to the eya. The resolution shown on the specifications chart is again the ultimate theoretical limit. In reality, sevaral factors serve to lower the resolution. The width of pan tips is greater than the ultimate resolution of either plotter. It has to he if portions of any plot are to he filled in with solid color. The wide lines can obscure tha finest moves of the highly-accurate positioning mechanisms. Many software packages do not exploit the ultimate capabilities of either plotter. Both the Hewlett-Packard and Houston Instruments plottars can produca charts without apparent "staircasing," but both may produca charts that resemhla fire escapes whan using some softwara packages.

Nor can the H-P 7470A claim all tha advantages. The DMP-40 handles charts twice as hig as the H-P. And tha DMP-40 hoasts a wider variety of pen styles and utilizes a greater variety of drawing media than the 7470A.

Although both plotters are precision instruments, the H-P exudes a certain delicata quality. Tha HiPlot seems to be much more robust. It uses bigger motors and heavy-machinad castings rather than stampad pieces.

Unless you plan to writa your own graphics programs, the higgest consideration you'll faca in choosing a plotter is software. Instaad of choosing a software package to match your plottar, you may he happiar choosing a plotter to match the software package that gives tha results—accuracy, speed, convenience, graph and chart styles, and drawing capahilitias—that you want and need. */PC*

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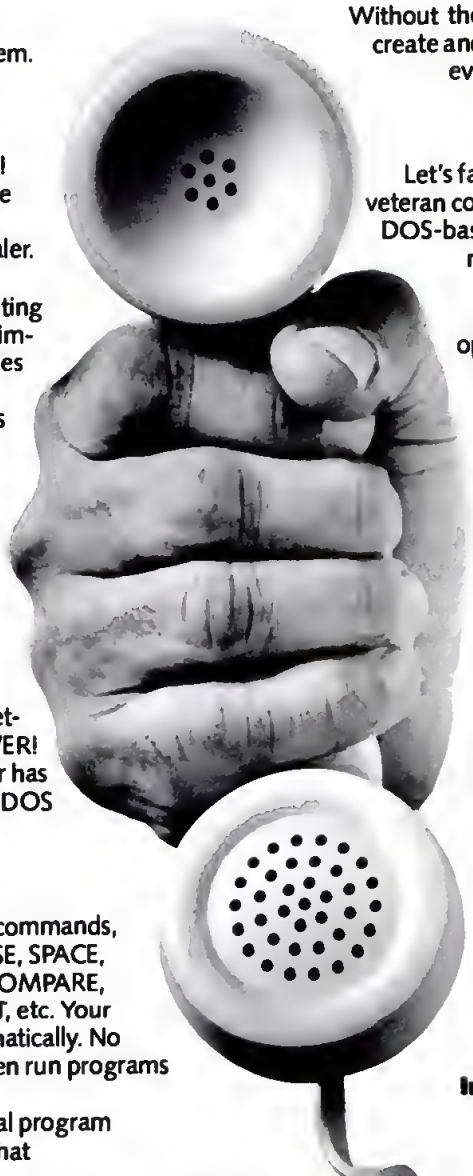
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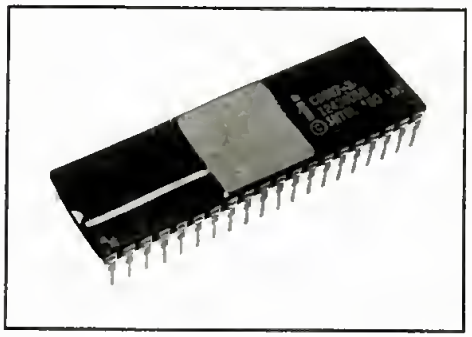
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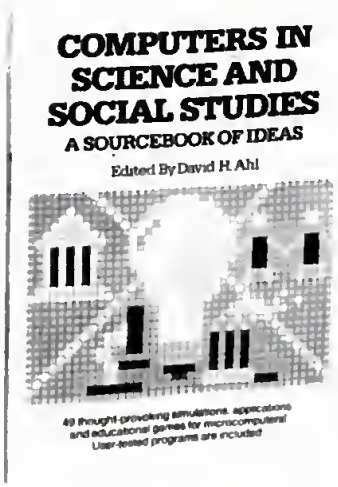
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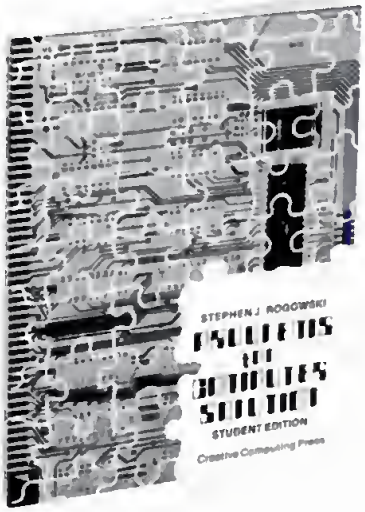
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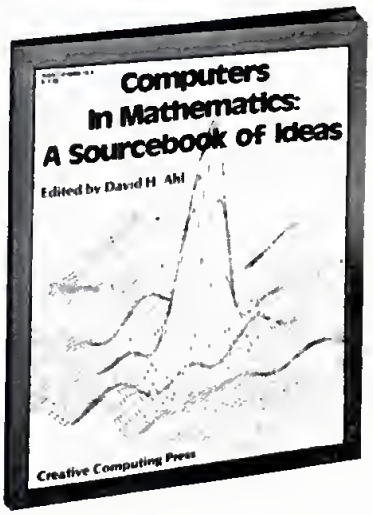
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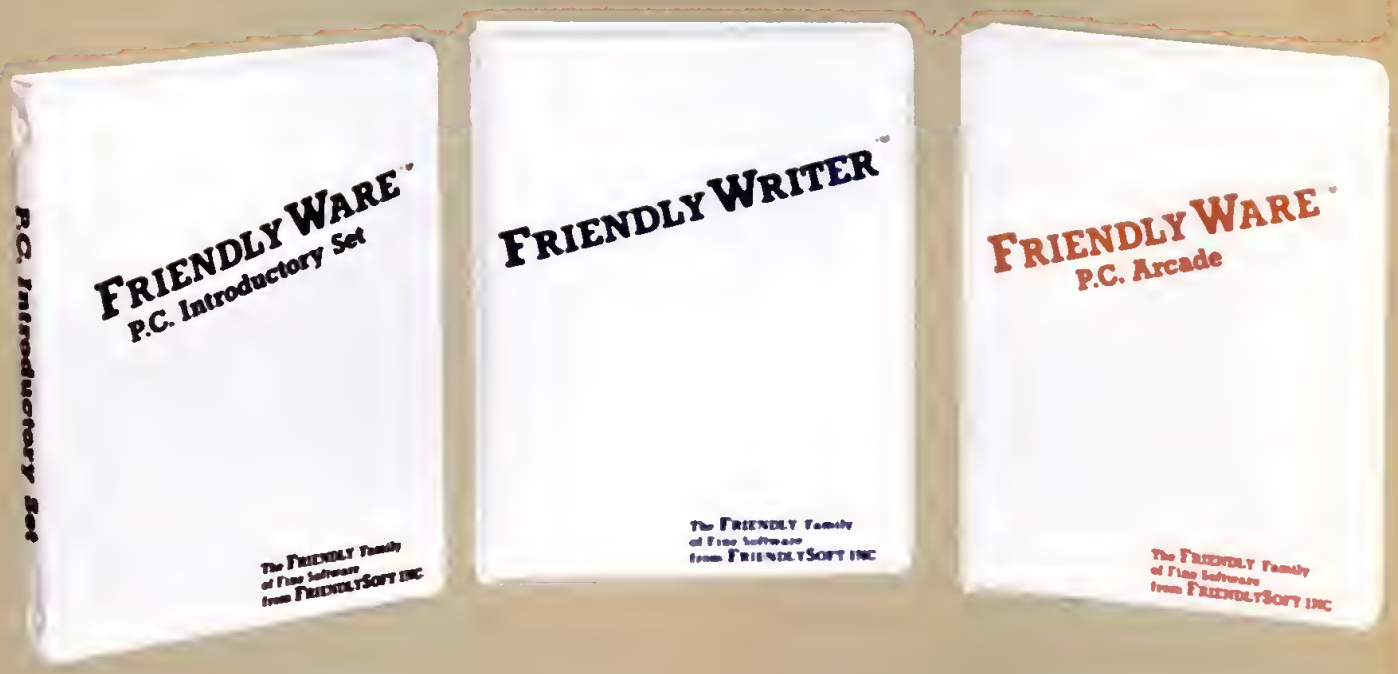
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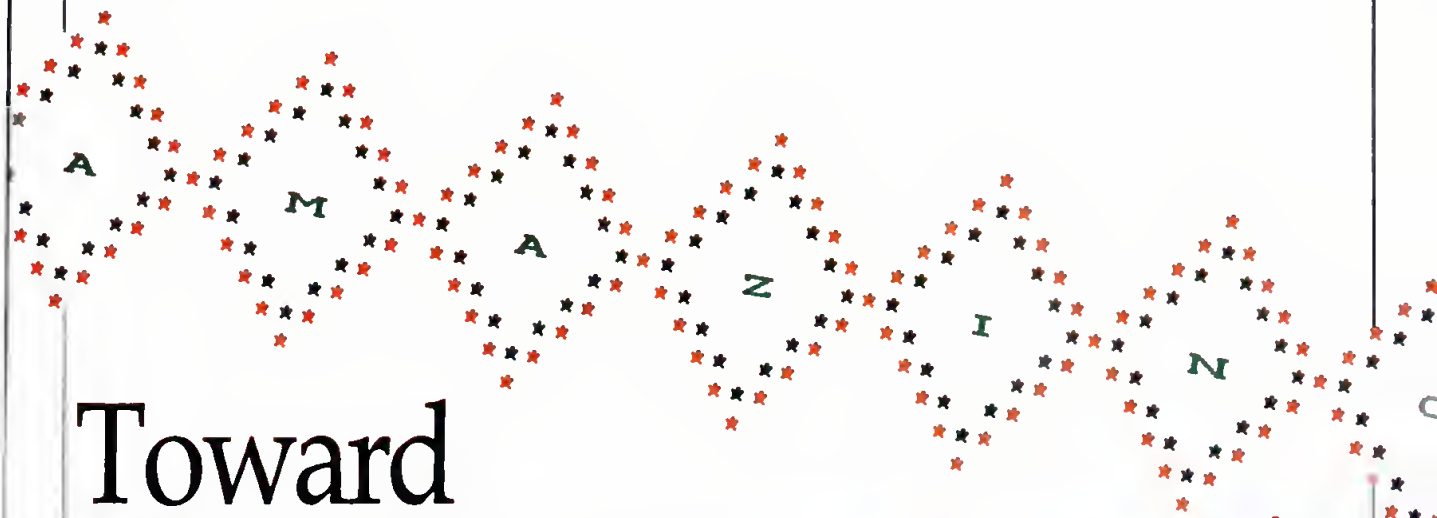
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SOFTWARE/STEPHEN MANES

*Take any word processor, an IDS Prism printer, and Colortext. Mix carefully. Then print in color without a graphics card or color monitor*




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Colortext
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**List Price:** $149 (plus $3 shipping); disk of examples $10

**CIRCLE 698 ON READER SERVICE CARD**

Need a spot of color to tart up a flannel-gray résumé? In the mood for a bit of chartreuse to offset all that red on your bottom line? Jupiter Island's Colortext and the Integral Data Systems (IDS) Prism color printer to the rescue!

The Prism's most singular feature is undoubtedly its ability to print in full color. This has been dandy for people with graphics cards and color monitors. But the Prism also has a few tricks up its sleeve for us green-screen keyboarders.

Colortext is a utility specifically designed to harness the talents of the Prism printer. ft runs on a 64K PC and cares not a whit which monitor interface card is installed. The color-equipped Prism 80 or the 132 printer it drives may run in either serial or parallel mode.

## Smart or Too Smart?

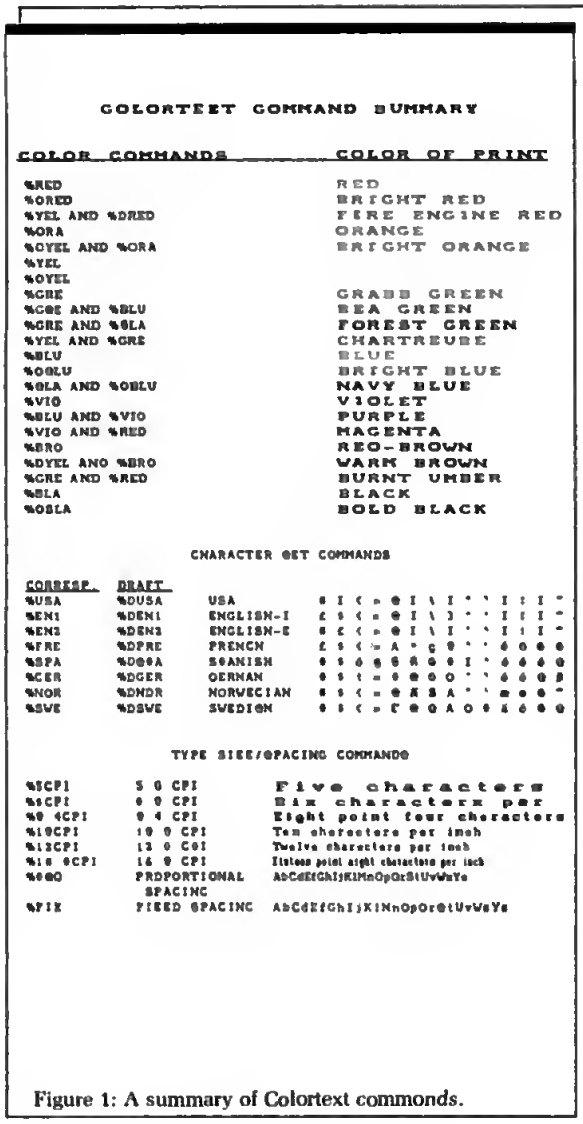
The Prism is smart. In high speed "draft" or better-looking "correspondence" mode, it can put out characters in six different widths with either fixed or proportional spacing. Alas, sometimes the printer is not quite as smart as it needs to be, and at other times, it's too smart for its own good.

Take "microspace justification." The Prism can insert extra spaces evenly between letters rather than merely between words to give justified text a neater look. Unfortunately, for this feature to work, the Prism insists that your text files be set up in a very peculiar way indeed, and I don't know of a single word processing program that supports it.

The Prism's color features and seven foreign-language character sets are dandy, too, but they require such long codes to invoke them that WordStor can't fit them in. Even proportional spacing can be a problem. To make underlining available, a program like WordStor has to be patched to make the Prism behave like a backspacing teletype, which not only slows it down but also makes boldfacing impossible.

## Operation

Colortext helps solve some, but not all, of these problems. You use the word processor of your choice to create a document



COLORTEXT COMMAND SUMMARY

| COLOR COMMANDS | COLOR OF PRINT |
|---|---|
| %RED | RED |
| %ORED | BRIGHT RED |
| %YEL AND %ORED | FIRE ENGINE RED |
| %ORA | ORANGE |
| %OYEL AND %ORA | BRIGHT ORANGE |
| %YEL | |
| %OYEL | |
| %GRE | GRASS GREEN |
| %GRE AND %BLU | SEA GREEN |
| %GRE AND %BLA | FOREST GREEN |
| %YEL AND %GRE | CHARTREUSE |
| %BLU | BLUE |
| %OBLU | BRIGHT BLUE |
| %BLA AND %OBLU | NAVY BLUE |
| %VIO | VIOLET |
| %BLU AND %VIO | PURPLE |
| %VIO AND %RED | MAGENTA |
| %BRO | RED-BROWN |
| %OYEL AND %BRO | WARM BROWN |
| %GRE AND %RED | BURNT UMBER |
| %BLA | BLACK |
| %OBLA | BOLD BLACK |

CHARACTER SET COMMANDS

| CORRESP. | DRAFT | | |
|---|---|---|---|
| %USA | %DUSA | USA | # $ @ [ \ ] ^ ` { \| } ~ |
| %EN1 | %DEN1 | ENGLISH-1 | £ $ @ [ \ ] ^ ` { \| } ~ |
| %EN2 | %DEN2 | ENGLISH-2 | # £ @ [ \ ] ^ ` { \| } ~ |
| %FRE | %DFRE | FRENCH | £ $ à ° ç § ^ ` é ù è ¨ |
| %SPA | %DSPA | SPANISH | ₧ $ á ¡ ñ ¿ ^ ` í ó é ú |
| %GER | %DGER | GERMAN | # $ § Ä Ö Ü ^ ` ä ö ü ß |
| %NOR | %DNOR | NORWEGIAN | # $ @ Æ Ø Å ^ ` æ ø å ~ |
| %SWE | %DSWE | SWEDISH | # $ É Ä Ö Å Ü é ä ö å ü |

TYPE SIZE/SPACING COMMANDS

| | | |
|---|---|---|
| %5CPI | 5 0 CPI | Five characters |
| %6CPI | 6 0 CPI | Six characters per |
| %8 4CPI | 8 4 CPI | Eight point four characters |
| %10CPI | 10 0 CPI | Ten characters per inch |
| %12CPI | 12 0 CPI | Twelve characters per inch |
| %16 0CPI | 16 0 CPI | Sixteen point eight characters per inch |
| %PROP | PROPORTIONAL SPACING | AbCdEfGhIjKlMnOpQrStUvWxYz |
| %FIX | FIXED SPACING | AbCdEfGhIjKlMnOpQrStUvWxYz |

Figure 1: A summary of Colortext commands.

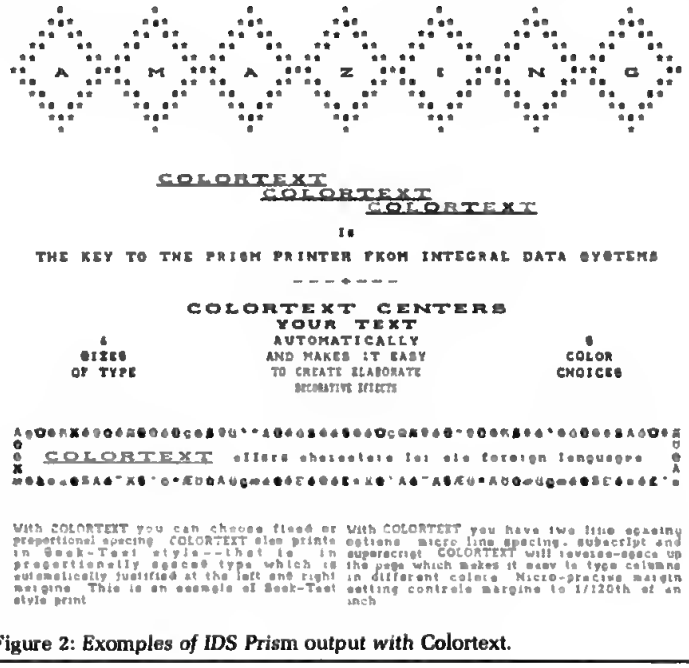



Figure 2: *Examples of IDS Prism output with* Colortext.

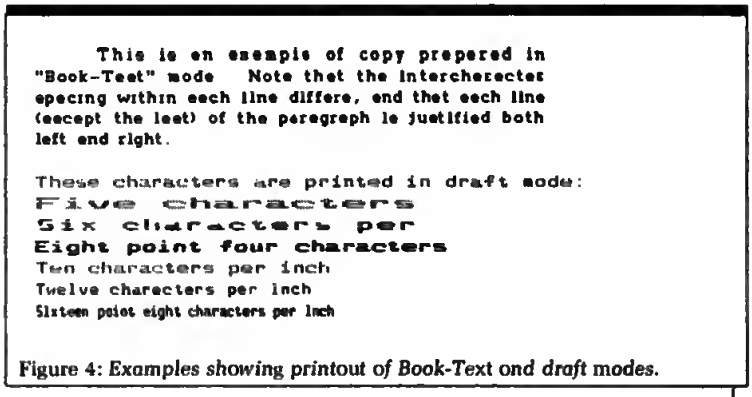



Figure 4: *Examples showing printout of Book-Text and draft modes.*

that includes special commands for Colortext. When you're ready to print, you run your document file through Colortext instead of the word processor.

A percent sign (%) in column one of the document tells Colortext that the rest of the line is a command, of which more than 50 are available (see Figure 1). Most commands—including those for color, margination, and character set and size—affect subsequent text until they are changed. Others—such as those setting text flush right, centering it, or overprinting—affect only the line immediately following the command. Microspace justification, which Colortext calls "Book-Text" mode, requires a command be embedded before and after each paragraph.

Simple? Let's toss a few of those commands into our WordStar files and see our name in living color.

## File Fussiness

Not so fast, rainbow digits. Colortext isn't as finicky as the Prism about the files it's willing to hang out with, but it is definitely particular. What it really wants is a file with a carriage return after each line and no special characters anywhere. That sort of file, unfortunately, is not what most word processors give us.

WordStar's standard document mode, for example, produces files with special characters you can see while you're creating text—such as Ctrl-S for underlining. It also adds special characters you can't see unless you examine the file by typing Type Filename from DOS—characters that mark page breaks, end of word-wrapped lines, and God knows what all. These all must go if Colortext is to perform its magic.

PeachText, on the other hand, stores each paragraph as one long line with the only carriage return appearing at the end. That won't satisfy Colortext, either.

## File Fixing

The Colortext manual gives some particulars about converting existing WordStar files for its use. Unless you are a WordStar expert, however, this procedure won't be easy. The manual advises that it is better to create Colortext documents in WordStar's N (non-document) mode. The key here, undocumented in the manual, is to use WordStar's mostly ignored Ctrl-OV command to change the fixed tabbing default to the more familiar variable-tabbing mode. Failure to do this will probe-

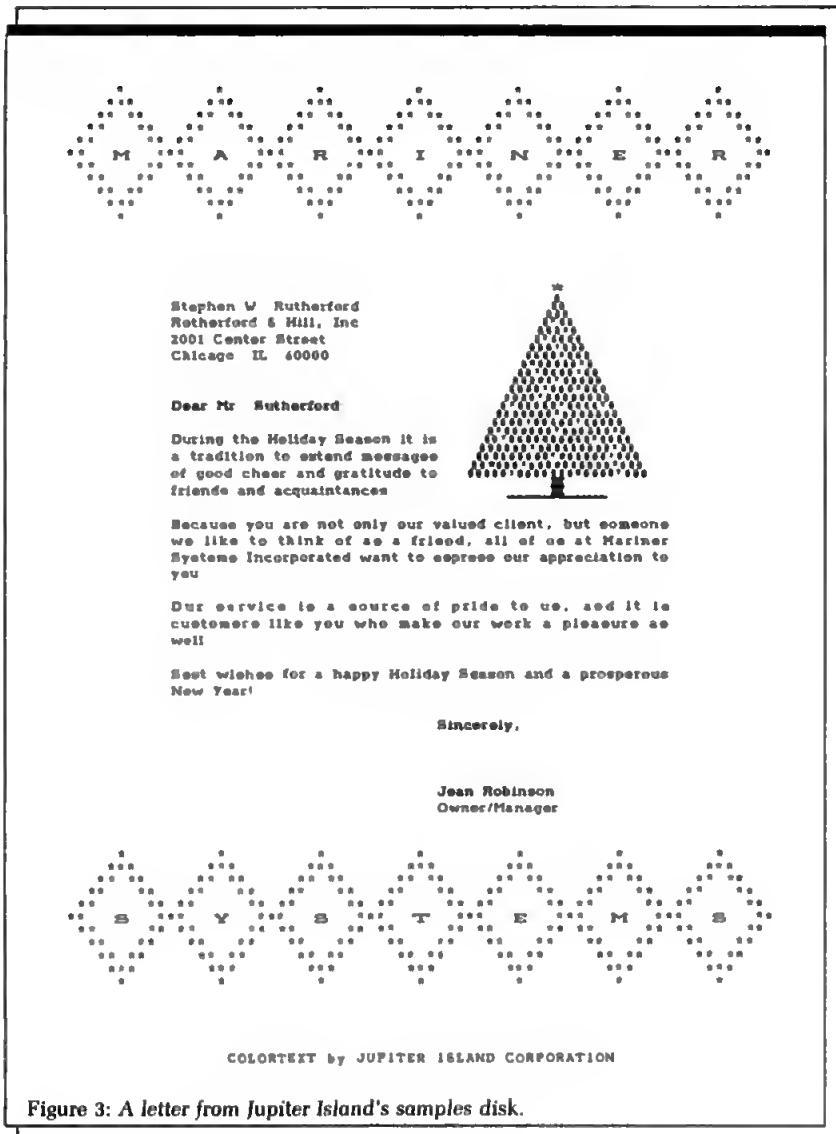



Figure 3: *A letter from Jupiter Island's samples disk.*

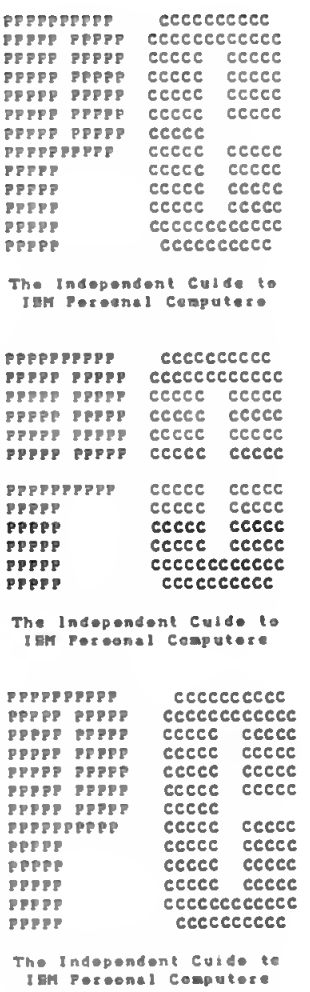



Figure 5: *Three versions of a familiar logo.*

bly leave your files studded with nasty items known as ASCII tab characters. They are invisible even from DOS. They can cause big problems in editing, and they are generally Bad Characters. The Colortext manual doesn't mention them, and the index to the WordStor manual doesn't tell you where to find out about them. I learned from bitter experience.

I didn't experiment with PeochText, but I suspect that all its files need is a paragraph marker (aka carriage return) at the end of each line. Other word processors will have their own idlosyncrasies.

## Colorful Sounds

All right; you've created a special document. You've supplied all the proper carriage returns and gotten rid of all the control characters. You've copiously salted the file with Colortext commands. Now you're ready to see if your printer can talk a blue streak.

Invoke Colortext by typing CTX. Respond to two prompts asking you for the name of the file to be printed and the number of copies you want (up to 9999). The next sound you hear will be your Prism printer merrily producing color copy.

And what sounds! You have not lived until you've watched and listened to the Prism go through its paces on the sample provided with the Colortext disk. The Prism grunts, groans, snores and squeals as it pulls and pushes the paper back and forth for overprinting, shifts through its half-dozen character sets, justifies text in two-column blocks, and outputs a page so full of parti-colored cedillas, circumflexes, umlauts, and tildes that it resembles nothing so much as an explosion in a Common Market print shop (Figure 2). This might well be the best cheap computer date since chatting with *ELIZA*.

Jupiter Island offers an additional disk of examples, including the Christmas tree letter (see Figure 3) and the color mixing chart in Figure 1. The company charges $10 for the demonstration; considering that all the examples will fit on the single-sided program disk, the demo should be free. However, it is the best way to learn how to do fancy decorative borders and complicated character graphics. And it also gives you some idea of which colors look good together—and which don't.

The Colortext manual was set on a Prism printer using the "Book-Text" mode (see Figure 4). In this mode you're limited to single-pass colors: black, red,

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blue, and the faint-and-mostly-for-mixing yellow. You give e %BON commend et the beginning of the paragraph, and signify the end of the paragraph with e %BOF command. In this mode, Colortext interprets the carriege return et the end of eech line as a space and lets the Prism worry ebout justifying the text.

### Learning To Color

Colortext's error trapping is good. if you do something egregiously stupid—entering a command it does not recognize or ordering it to do something impossible—Colortext sends you an onscreen error messege. Otherwise, it is time to take a look at your text. If you did everything right, you're in business. If not, it's back to the word processor for e fix.

How hard is it to learn the workings of Colortext? For most of the commands, the answer is "not very," once you get your text files into proper shepe. Trying the 19 examples offered in the menual gives you e feir working knowledge of Colortext's capebilities. I had most of the examples working on the very first try.

Avoid the tabbing commends, though, unless you are very friendly with those Bed Characters I mentioned above. The manual definitely does not provide a proper introduction.

### The Experiment

The PC logos (see Figure 5) were my experiment. The ell-green one was duck soup. The rainbow version was e lot more complicated. Using the 12 basic colors—the ones in Figure 1 that require only one command—would have been fairly straightforward, but I decided to try some of the two-command shedes. Those require overprinting, for which you have to issue e %NOSPACE command to keep the peper from moving, and then duplicate the line precisely in the text. The problem, of course, is thet you are likely to forget one of the duplicate lines and end up with a color you don't want. i kept a careful count of the duplicated lines, and the rainbow version came out fine.

The green and blue PC was fairly streightforward, too. I printed the P first, then reverse-fed the peper end reset the margins before doing the C. i learned that when things don't go right, incorrect margins should be a prime suspect. The Prism will wrap any excess material down to the next line when it reaches the right margin. i hed stupidly set thet margin e trifle too narrow—and paid for it with confusion and irritation. But fixing it was e matter of adjusting only one command.

*COLORTEXT IS A utility specifically designed to harness the talents of the Prism printer.*

### Annoyances

A few irritations: The character size commands are all whole numbers except for the 8.4 and 16.8 sizes. it's annoying to heve to remember what comes efter the decimal point in those commands, but if you omit it, you'll get an error message.

Underlining is e problem: In fixed-space mode you have to issue e %NOSPACE command and enter the underline


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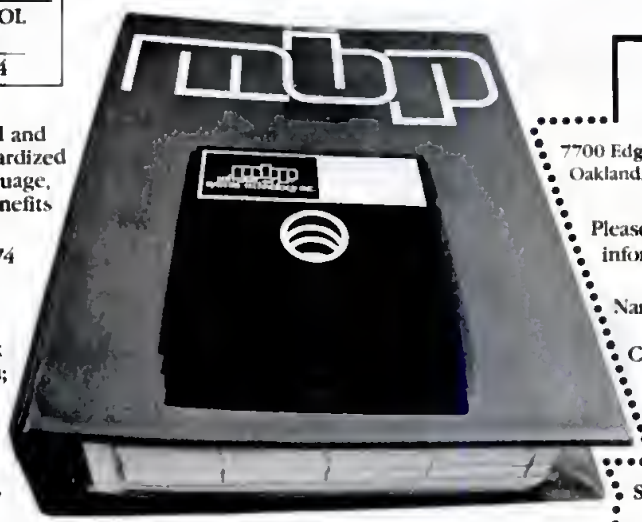
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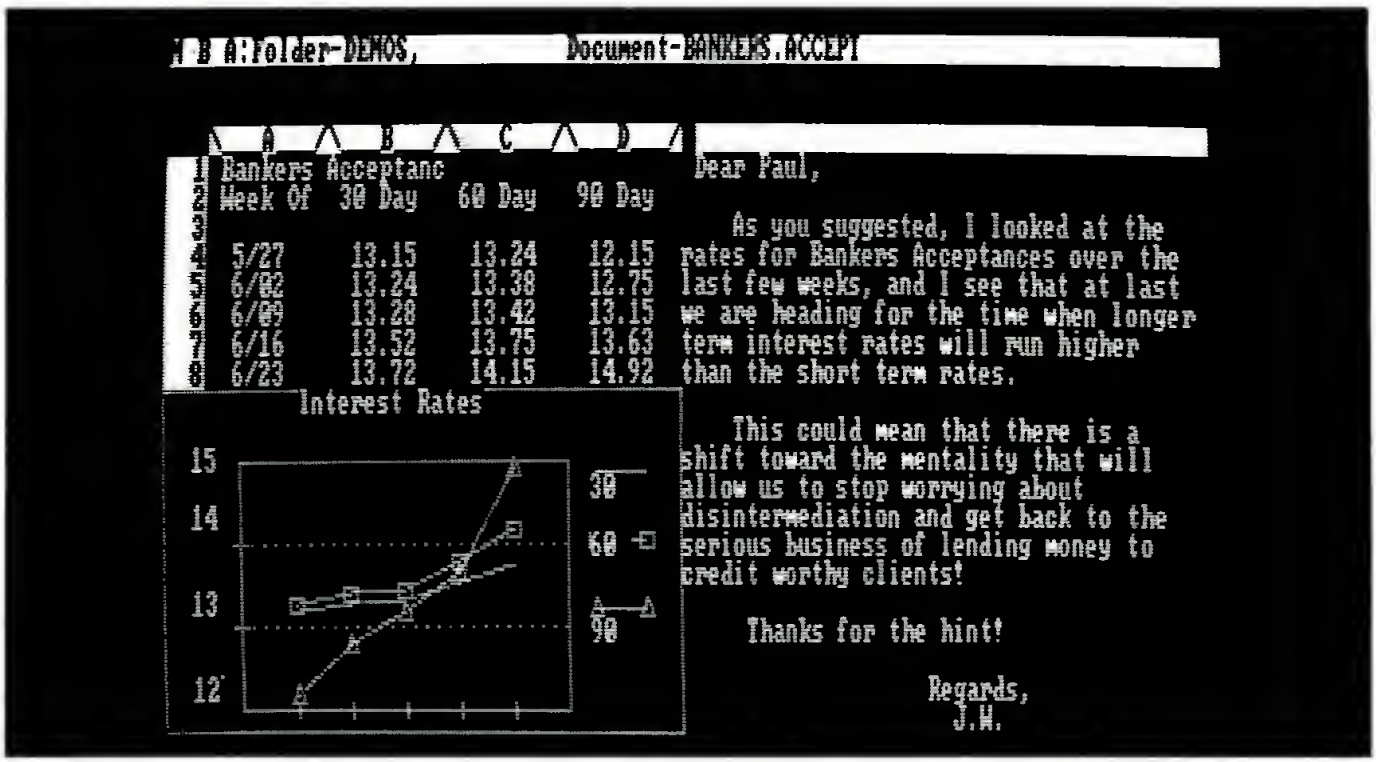
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CIRCLE 134 ON READER SERVICE CARD

by ovarprinting, but there's no good way at all to underline accurately in proportionel spacing or Book-Text modes.

Tha manual doesn't tell you how to exit the program. Ctrl-Braak sometimes works; while printing, however, the only choice is to turn off the printer. This isn't a bad idea, anyway; the Prism's buffer will dalay response to keyboard commands.

***DOING ALL those reverse feeds and laying down all those overprinted dots is not speedy.***

Doing all thosa revarse feeds and laying down all those overprinted dots is not speedy. It's really a limitation of the printar rathar then tha software, but printing a single letter-size page with a lot of fancy stuff can take as long as 3 minutes.

Perhaps the biggest nuisance is that if tha Prism is running in parallel moda, Colortext insists on doing a form feed evary tima you invoke it. This means that you end up using precisely twice as much paper as you really need, whan all you want to do is test ona of your dasigns. Jupitar Island presidant, David Strauss, says tha culprit is IBM's BASIC compiler, end that the form feed isn't activated when running tha Prism from a serial port.

A final shortcoming: Colortext would ba anhancad if it had a utility that automatically adjusts WordStar and other documant filas for use on tha Prism. This would make tha program handiar for frequant users.

### User Support

The Colortext menuel and supplament could be bettar organized, but thay gat tha job dona, providing you're reasonably familiar with the Prism's basics. I particularly like the inclusion of actual color printouts of tha axamples. You get to compare your output with tha manual to sae what, if anything, is wrong.

Another nice touch is the table showing which keyboard characters produce which foreign characters. IDS didn't bother to includa this information in thair manual for tha Prism.

Tha manual warns about potential jamming problems whan reversa-faeding lightweight peper. Sticking with 20-pound continuous forms and single sheets, I did a lot of revarse feeding, and nevar ran into anything remotely resembling a jam.

When I phoned Jupitar Island with e coupla of quastions, I was put through in just seconds to the operations manager (before revealing my journalistic idantity). Not only that, David Strauss returned my cell immediataly. I get the feeling Jupiter Island won't leave you in the lurch.

### Final Thoughts

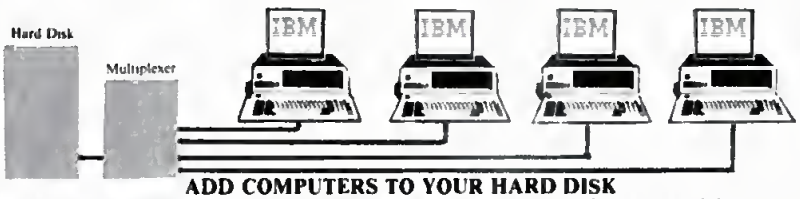
How much would I use this program? Hard to say. When I bought my Prism about a year ago, I wrote a group of utility programs in BASIC to handle a few of tha things Colortext takes care of so nicely—such es printing my latterheads.

But I use my Prism mostly for text, so I generelly use the all-black ribbon. Sinca you can shift through its four black bands, it lasts much longer than tha color modal. It's also cheaper and gives a much more


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intense black than the procass ribbon. Changing ribbons from ell-bleck to color requires careful cleening of the Prism ribbon-handling rollers, gears, end guidas with alcohol to avoid contaminating the process ribbon. It's e messy, painstaking process, indeed.

But if you use the color ribbon reguiarly, there's no problem. And in fooling around with this program I found thet color is just plain fun. The Colortext manual implies that you might use the product for such things as menus, wine lists, and advertising flyers, which sounds reasonable enough to me.

On the other hend, while quite good for dot-matrix output, text from the Prism isn't going to fool enybody into thinking your text was typeset or even typewritten. The Prism is not e printer I can eesily recommend. Meny of its design features are compromises. And some aspects of the machina seem utterly wrongheedad.

Should you eccidentelly use it to overstrike another color, the yellow portion of the process ribbon can becoma contaminated. Also, sections of the ribbons exposed to air heve e tendency to dry out and turn feint.

The Prism uses a lot of plastic foam for sound insulation, but that foam also traps heet. The ventiletion slots ere blocked by the peper emerging from the mechine, so the Prism runs hot. To keep it cooler, many of us remove the window for big jobs, thareby turning a modarately noisy mechine into e genuine ear-blaster.

***PRISM ISN'T going to fool anybody into thinking your text was typeset or even typewritten.***

The Prism can reed only 7-bit cherectars, so it treats ASCII characters 128 through 255 as though they ware 128 numbers lower. And the IBM Printer Adepter looks for some signal the Prism doesn't send. When you run the IBM diagnostic, it cannot be made to "see" the Prism. I heve elso hed trouble getting software spoolers to perform properly.

Many of the feilings of my Prism (including five defective windows and e tandency to chew up ribbons) have been fixed free by IDS, and I'm told those fixes heve been incorporeted into the design of more recent mechines. But other color printers are now coming onto the market at prices far balow the Prism's.

If you already own a Prism, who knows? That little edge Colortext can give your documents just might turn your competitors green with envy—or get them to see red. */PC*

*Contributing editor Stephen Mones is outhor of Video Wor (Avon) ond Thot Gome From Outer Spoce (Dutton). He is co-outhor of the onti-gravity fontosy The Bononos Move To The Ceiling (Wotts).*


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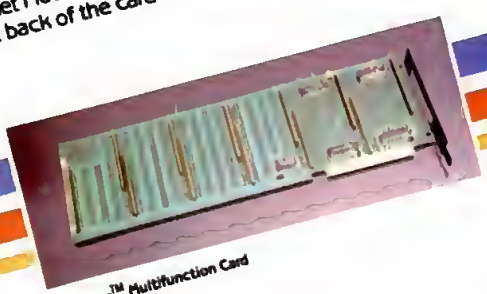
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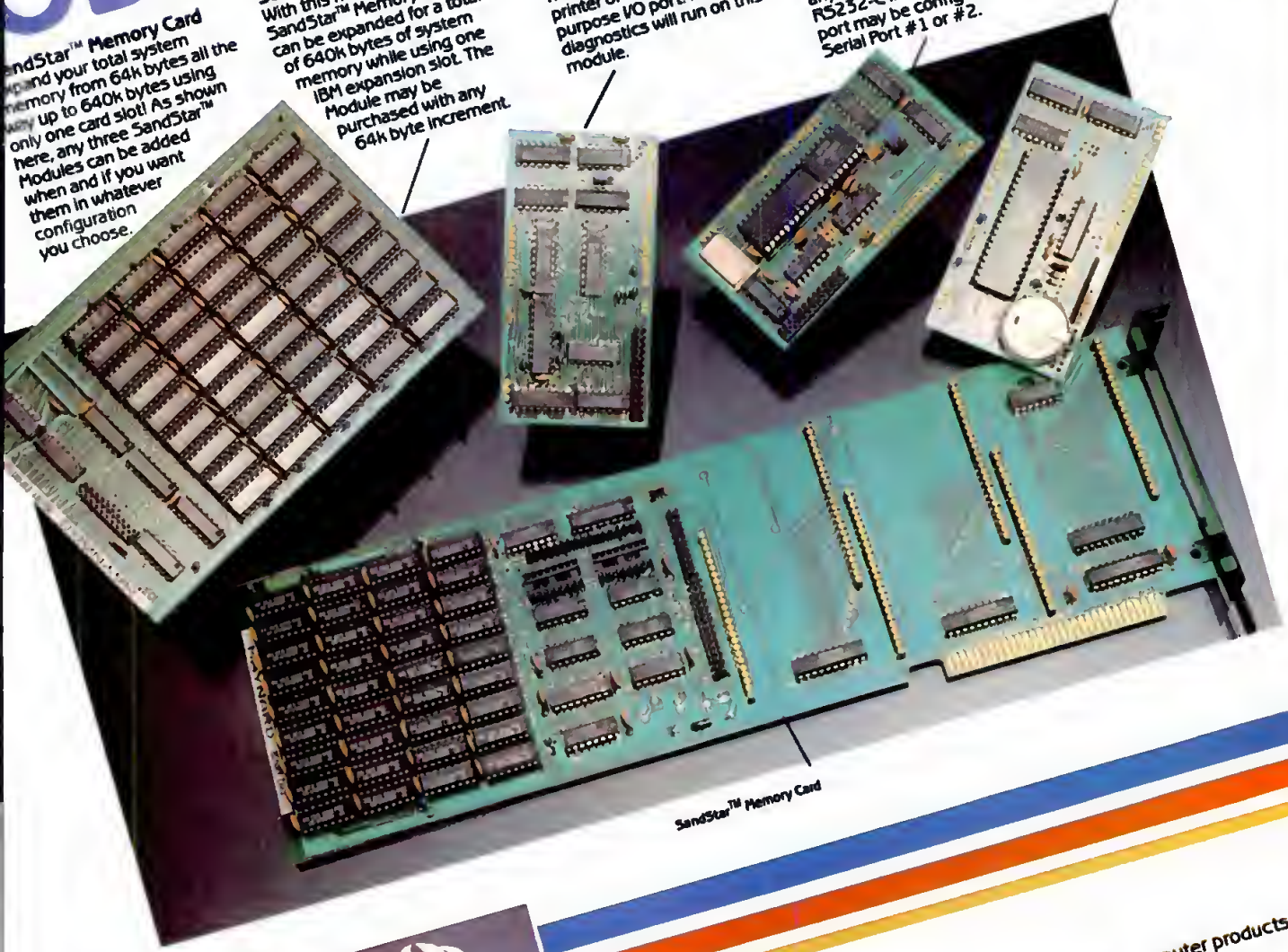
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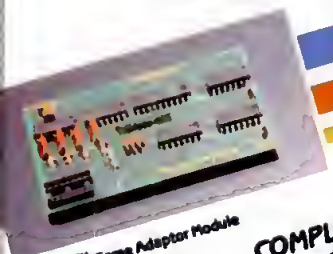
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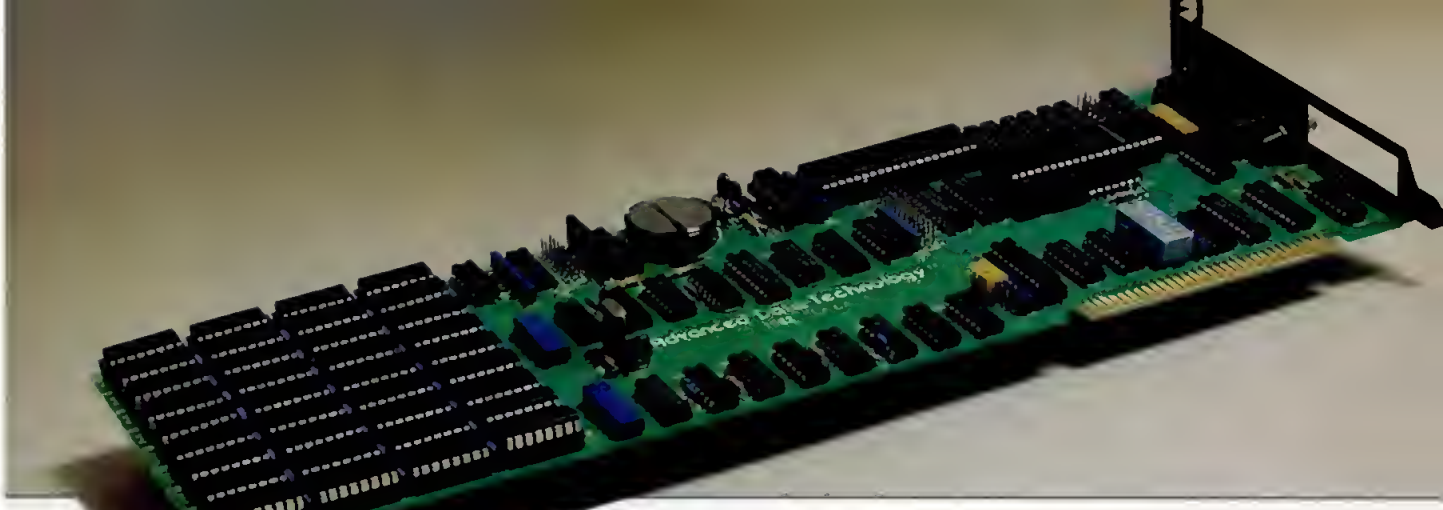
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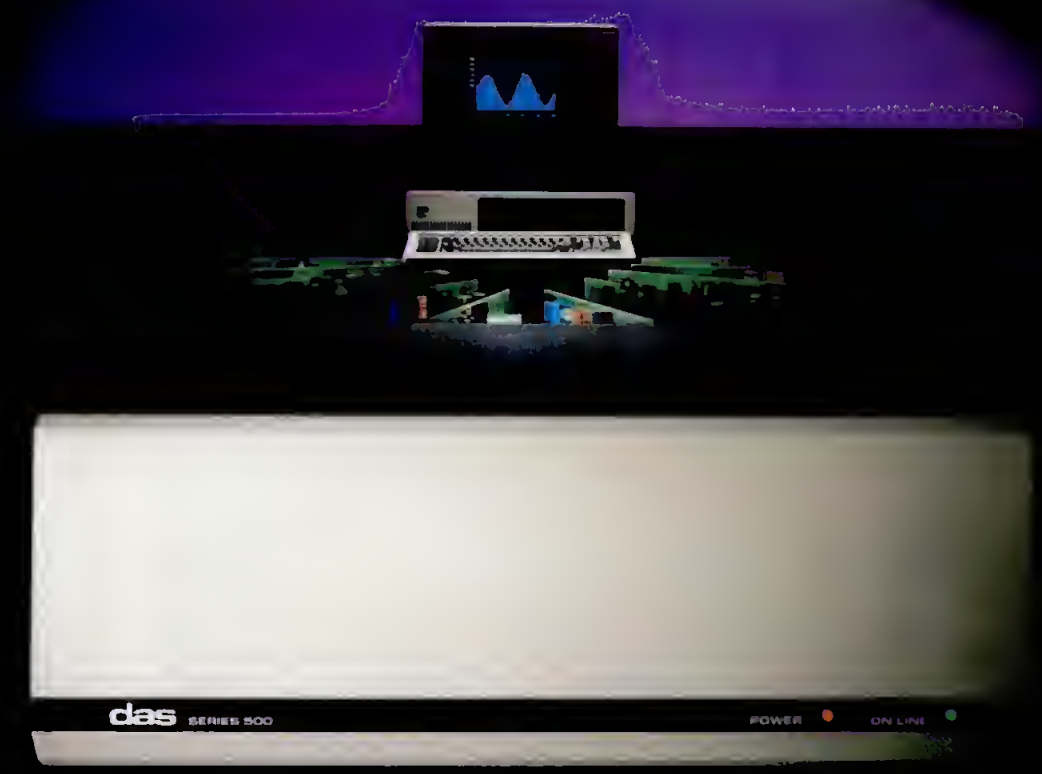
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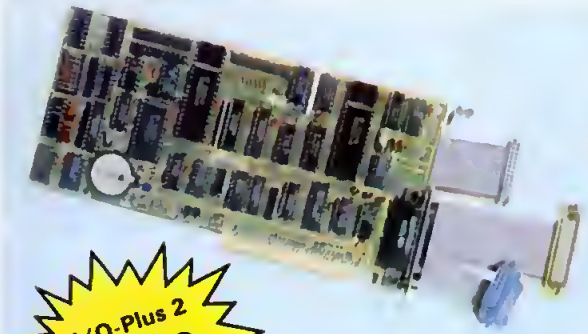
For complete information on the DAS Series 500 data acquisition and control system, write to us at Data Acquisition Systems, Inc., 349 Congress Street, Boston, Massachusetts 02210. Or call us at 617 423-7691.

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### MEGA WITH MEMORY

The MegaPlus™ has three functions standard: Parity checked and fully socketed memory up to 256k in 64k increments; clock/calendar with battery back-up for automatic loading of time and date when the computer is turned on; and an asynchronous communication port (RS232C serial) which can be used as COM1 or COM2, (DTE for a printer, or DCE for a modem). Optional is a 100% IBM compatible parallel printer port, and a second asynchronous port for another $35 each. The MegaPak™ option plugs onto your MegaPlus™ "piggyback" style to give you 512k of additional memory. Now you can create disk drives in memory up to 360k, set aside plenty of space for print spooling, and still have memory for your biggest programs.

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The I/O-Plus 2™ comes standard with a clip-on battery powered clock/calendar, and asynchronous communication port (RS232C serial). Optional is a second asynchronous port (DTE for a printer, or DCE for a modem), a parallel printer adapter, and the best game paddle adapter on the market. What's so special about our game adapter? Not only is it an IBM standard game port, but it can also use low cost, widely available Apple compatible paddles and joysticks. If your memory needs are satisfied, for less than the price of most single function boards, I/O-Plus 2™ gives you all the input and output ports you might need.

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### CHEAP SOFTWARE TOO

What good is great hardware without some great software to use it with? We offer some terrific prices on some of the popular programs you will want to use your board with. How about the cream of the spreadsheet programs, SUPERCALC, for just $159, or SUPERWRITER for $239. If you are looking for data base management you can get dBASE II by Ashton-Tate for $419.

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| 192k | $389 | 512k | $788 |

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|---|---|
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SOFTWARE/GEORGE C. HAYLES

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# The Graphics/Data File Connection

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K2A 3Z4 Canada
(613) 232-3826
**List Price:** $245
**Requires:** 64K, color or non-IBM graphics monitor, graphics adaptar board.

**CIRCLE 590 ON READER SERVICE CARD**

The developars of MicroGraph by 2Y's (MCG) anvision a software program that allows the average business user to create high-quality, cost-effectiva graphics. 2Y's Associates seem to have accomplished its objective. MCG does produce business-quality screen and printar graphics at a reasonabla cost. MCG is easy to use and learn, and tha program produces screen graphics with impressive speed.

## Features

MCG draws line graphs, bar charts (stacked, hidden, or side by side) X-Y plots (with dascriptiva statistics and "laast squaras" trend lina) and pia charts. You can display up to four series on the lina- and bar-chart graphs and up to two sarias on tha X-Y and pie-chart graphs. But, in a bar chart, when more than two serias are used, the hidden-bars option is not availabla.

The package is designed to run on the iBM PC with minimum 64K RAM and either a color or noncolor graphics monitor with the graphics-adapter board. MCG can be used with any Epson printar with the Graftrax option or the iBM dot-matrix printer. Additional modulas can be purchased for the HP 7470 plottar and the Calcomp 81 plotter. Both modules require 128K RAM and cost $50 each.

The approach used by MCG to manage data saries is simpla and straightforward. A standard DOS data fila, counting up to 40 layouts, is used as the largest unit of MCG data storage. A layout, the next largast unit of MCG data storage, contains all of the data from which a given graph is generated and can contain up to four data saries with up to twanty-four observations in each saries.

MCG can use your spreadsheet data without the time-consuming task of reantaring it. Tha package allows access to data files produced by VisiColc and SuperColc. i had vary littla trouble in producing a SuperColc output file that was easily and quickly read into an MCG "databasa." Howaver, packagas that hava lntegrated spreadsheet and graphics modules have an advantage over MCG's spraadsheet data-access capability becausa with MCG, the visual impact of data changes in the spreadsheet is not immediateiy reflectad. But MCG does allow tha user to viaw a model with a stand-alone graphics package. With this time-saving feature you do not have to re-entar data from spreadsheet files.

## Menu Options

MCG has a few shortcomings, but easa of installation and usa are not among them. Tha installation instructions provided ln tha manual are claar and easy to




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CIRCLE 291 ON READER SERVICE CARD

follow, and MCG is also aasy to use.

Figure 1 shows a display of MCG's main menu. If you want to enter data for a new graph, you use main-menu options 1 or 5. If the data is to be entered manually, select option 1. A blank layout screan will

***DATA TRANSFER from one application to another is probably one of the most difficult operations faced by the nontechnical user.***

ba displayed with reverse video fields for data entry of a layout name, two title lines, units in which the data is axpressed (that is, $000 for thousands of dollars), vertical-axis title, horizontal-axis titla, series names (four of them) and obsarvations (individual data points).

The data is entered with relative ease. Any definition fialds may be left blank for later modification, and missing data points are shown by using the valua −999. I used the main-menu option 1 to enter data manually for the stockbroker statistics (shown in Figures 2 and 3). I entared and graphad this data in less than 5 minutes.

Displaying existing data from the main menu is accomplished by using only two kaystrokes. After the data is displayed, striking the return kay takes you back to the main manu. You can modify existing layouts by answering a series of questions as to what is to be modifiad and then ovarwriting tha existing data.

To transfer layouts from one DOS data file to another, use the Extract option. This is the primary method used by MCG to eliminate obsolete layouts. To transfer VisiColc or SuperColc data MCG, choose the Read option. This faature is cumbarsoma but highly usaful. Data transfer from one application to another is probably one of tha most difficult operations faced by the nontechnical user. However, the manual illustrates as wall as describes the spreadsheet-transfer process clearly.

Use the Graph option (main menu item 6) to produce all graphs excapt those using

*Figure 1: The moin-menu disploy for MCG.*

```
                                                                    DD7
                                                                    :
^DDDDDDDDDDDDDDDD6                                                  GDDDDDDDDDDDDDDDE
                                                                    DD=

                        data file name DEMO.MCG

                  [1]  New layout; data entry
                  [2]  Display of layout data
                  [3]  Modification of layout data
                  [4]  Extract layout data from another file
                  [5]  Read VisiCalc generated data (DIF format)
                  [6]  Graph (high or medium resolution)
                  [7]  Trend analysis (scatter diagram)
                  [8]  Select another file name
                  [9]  EXIT
```

*Figure 2: Display of layout data on MCG.*

```
Layout name    STOCK BROKER STATISTICS
Title line 1   FULL TIME REGISTERED REPRESENTATIVES
Title line 2   (New York Stock Exchange Member Firms)
Unit. ident.                 Vert. axis label NUMBER OF BROKERS
Horiz. axis    (Source: Lipper Analytical Distributors,Inc.)
ÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ
Obsv.\Ser. 1        2        3        4
ÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ
1  1972   39970 -999   -999   -999
2  1973   36290 -999   -999   -999
3  1974   33306 -999   -999   -999
4  1975   34643 -999   -999   -999
5  1976   35289 -999   -999   -999
6  1977   37740 -999   -999   -999
7  1978   40687 -999   -999   -999
8  1979   43993 19200 -999   -999
9  1980   46702 26400 -999   -999
10 1981   51603 25000 -999   -999
11 1982   55000 30000 -999   -999
12 1983   58500 32000 -999   -999
ÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ
Series 1  NUMBER OF BROKERS          Series 2  AVG. COMMISSIONS IN 1ST YEAR
Series 3                             Series 4

Enter <CR> to return to the menu
```

*Figure 3: Illustration of bar chart with side-by-side bars.*

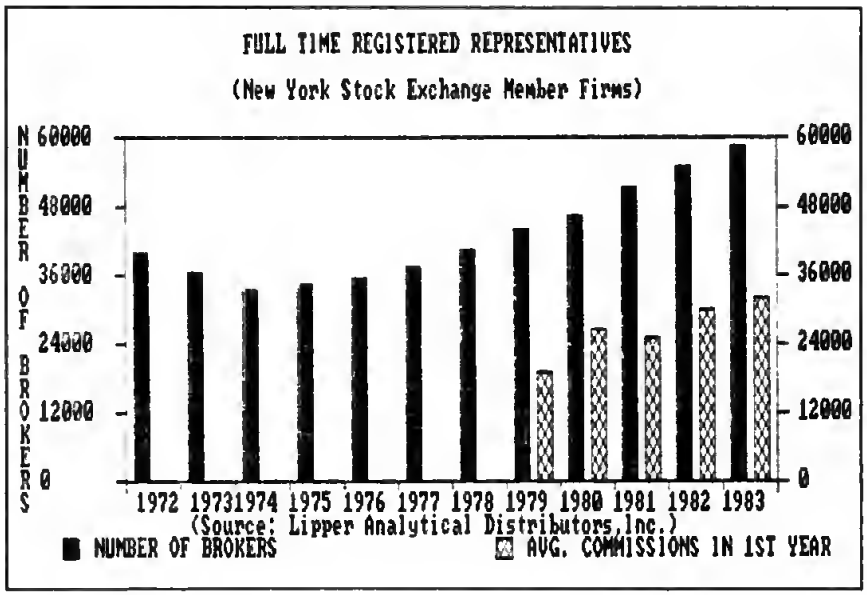


*Figure 4: Sample graph shawing MCG's "stacked" bar-charting capabilities.*

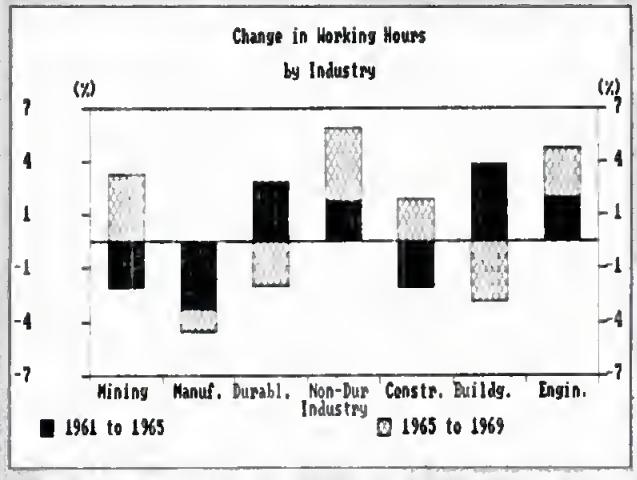



*Figure 5: Sample graph showing MCG's "hidden" bar-charting capabilities.*

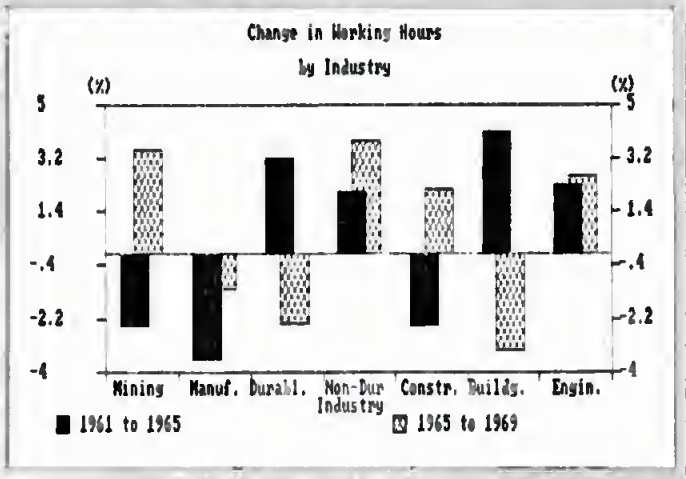



*Figure 6: Sample graph showing MCG's pie-charting capabilities.*

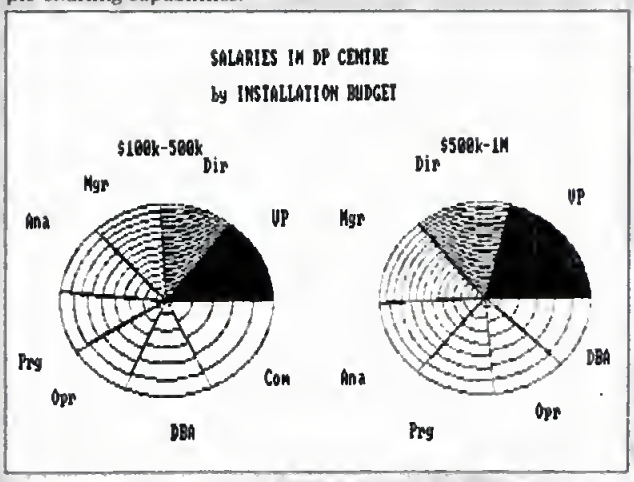
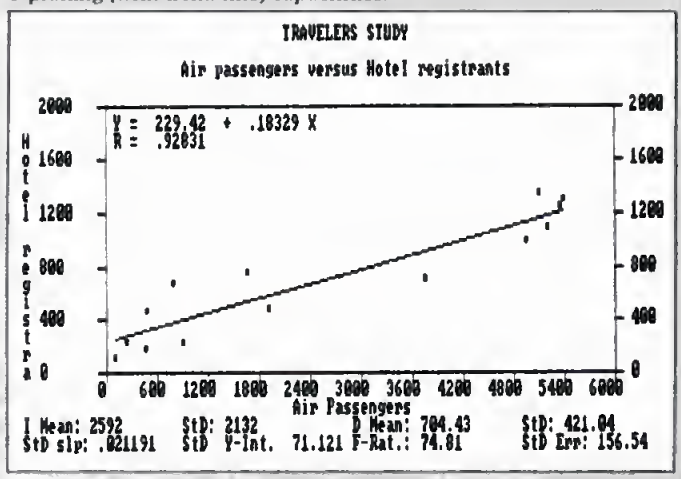



*Figure 7: Sample graph showing MCG's X-Y plotting (with trend line) capabilities.*




X-Y plots. (The X-Y plot graph is produced using option 7.) After a layout has been selected, each series name is presented in sequence with e request to define the type of display to be used with the particuler series. You may choose a mixture of line end ber grephs. The bar graphs mey be stacked (see Figure 4), hidden (maximum of two series; see Figure 5) or side by side (see Figure 3). You key your choice by responding G for line graph, B for bar graph, Cn for stacked ber greph (where n is the series number to be stacked on) or P for pie chart (see Figure 6). A series mey be omitted from the graph display by responding with a carriage return.

MCG does not allow a pie chart to appear with any other type of graph and two is the maximum number of pie charts that can be displeyed on one graph.

Any graph can be printed on the printer. The sample graphs shown in the figures were produced using the Epson MX-80 printer with Graftrax option. Hardcopy grephs may be produced in different sizes end resolutions. The medium-resolution printer graphs are faster and may be acceptable for draft copies. The medium-resolution option is also used with color monitors. Samples used in this article were produced under the high-resolution option. Printer grephs ere produced in formet sizes ranging from 5¼ by 3½ inches to 11¾ by 17½ inches. Obviously, because of the size of some of the formats, some graphs require the larger page size of the MX-100 printer.

The trend-anelysis option produces e greph showing the trend line drewn through the X-Y plot of two series (see Figure 7). MCG uses a simple linear-regression model to fit the trend line to the peirwise plot of series X against series Y. The descriptive statistics for each series are displayed on the greph elong with the regression statistics used to produce the "least squared" trend line. The independent and dependent variables are defined through prompt responses just prior to the execution of the calculations for the regression. The celculetions do not deley the display of the greph.

MCG uses default velues for most options and prompts. In most cases, a carriage return will cause the software to select the defeult value, but the program ellows the user to override default

choices. By running through the different choicas of graph typas, you can sea data displayed in different forms (bar, lina, pia, atc.) and choose the moat viaually-effactiva alternativa.

### Shortcomings

*MCG*'s biggest shortcoming is its inability to dalata layouts from the database. A confusing and illogical procesa is required to rid the database of the axcess baggaga that is cartain to accumulate as layouts are added and modifiad. Tha only way you can clean up tha obsolete and inaccurate layouts is to use the Extract option (menu itam 4) to mova tha "good" layouts to another database. When all good layouts are duplicated in the other databasa, tha old DOS data fila containing the good and bad layouts is delatad. Sinca Extract option transfars only one series at a time to another databasa, this can ba a very time-consuming process. 2Y's Asaociates plans to add an option in a futura release that will give users the option to ovarwrita an existing layout or create a new one.

It's only a minor concarn, but *MCG* doas not provide a way to stop the output to tha printar. If you want to print ona of the larger graphs, such as ona in 11.75- by 17.5-inch format in tha high-resolution moda and you naed to stop tha printar output, it appears that your option is to turn off tha printer. According to 2Y's, tha naxt relaasa (Varsion V2.0) has a Break command to stop all processing.

***IT'S ONLY A minor concern, but MCG does not provide a way to stop the output to the printer.***

Finally, some users may object to the limitation of 24 obsarvations per data series. For instance, investors who use graphics to study trends in atock prices may find this limit unacceptable because 24 data points may not always be sufficiant to analyse tha trend visually.

### Still to Come . . .

Rodney Dobson of 2Y's Associates indicatad that Version V2.0, to be releasad in April, will also allow accesa to data usad by *Multiplon* and dBase *II* in addition to that usad by VisiColc and SuperColc. Mr. Dobson said that version V2.0 providas a command-fila capability that enables predefined graphs to be produced automatically. Up to 50 graphs may be dafinad in this manner and used in "boardroom type" graphics presentations. According to Dobson, users of version V2.0 will ba abla to use this capability to send complataly-dafined graphs to other computars and to remota locations via modem and phona lines. In addition to prompting for printer output, Version 2.0 wiii prompt the usar for output to the HP 7470 and Calcomp 81 plotters. People who own Version V1.0 can upgrade to version V2.0 for $100.

***MCG SHOULD be a welcome addition to most business-software arsenals.***

Also in tha davalopmant staga is an interface using the Telidon AT&T Standard, for vidotext-database storage. The prica of the vidaotext module will be $85. Dobson axpects thia option to be available somatime this summer.

### Recommendations

In summary, it appears that *Micrograph* by 2Y's is an easy-to-laarn and easy-to-use product. It produces good high-resolution business graphics. My only reservation in recommanding *MCG* has to do with whather or not you already own a spreadsheet. If you don't you might want to invastigata tha intagratad spraadsheet and graphics software that have recently become available for the IBM PC.

*MCG* has a few shortcomings as most packages usually do. Howevar, *MCG* should be a welcome addition to most business-software arsenals. It offers some graphing features that the integrated pakages don't have, and it costs less. */PC*


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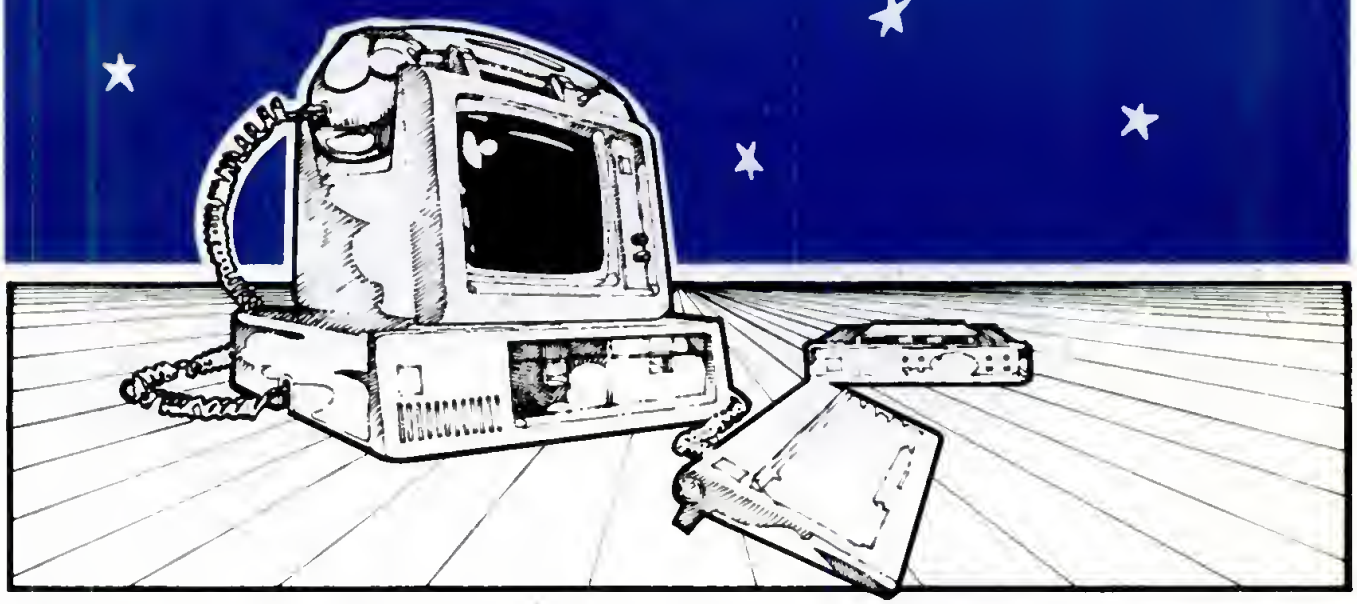
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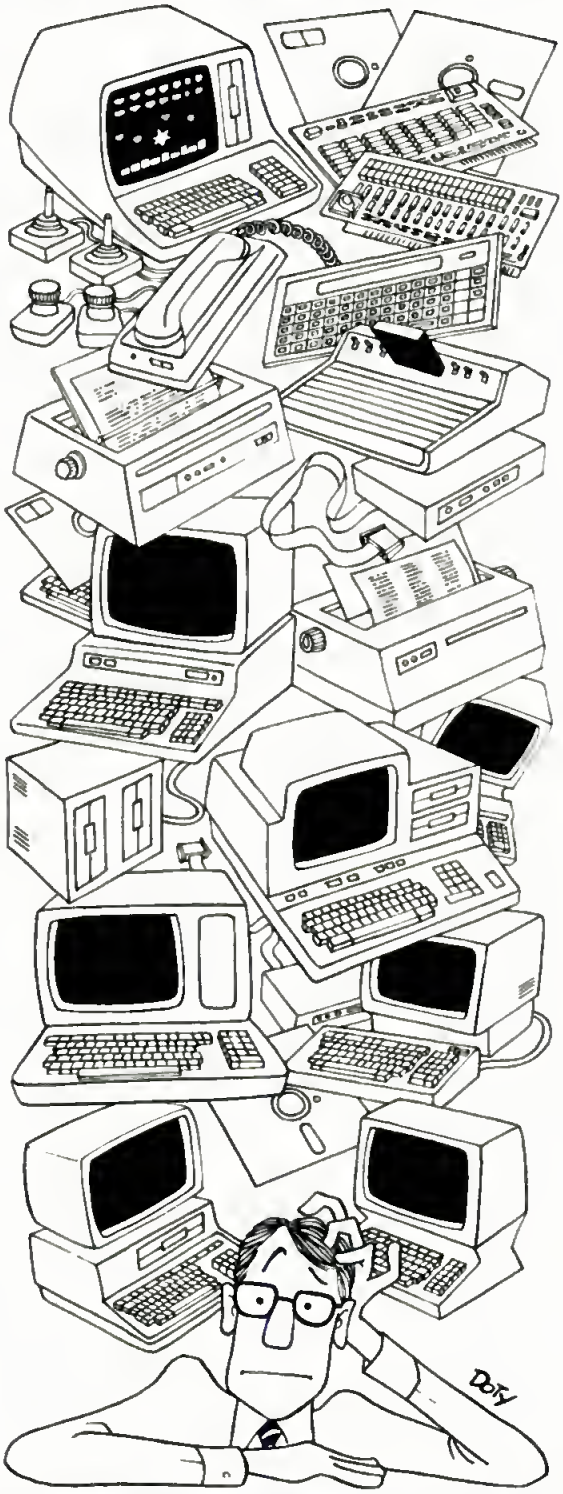
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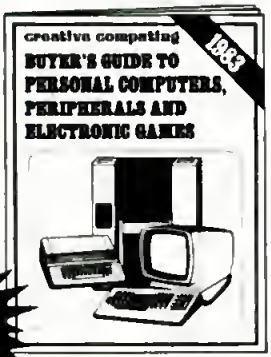
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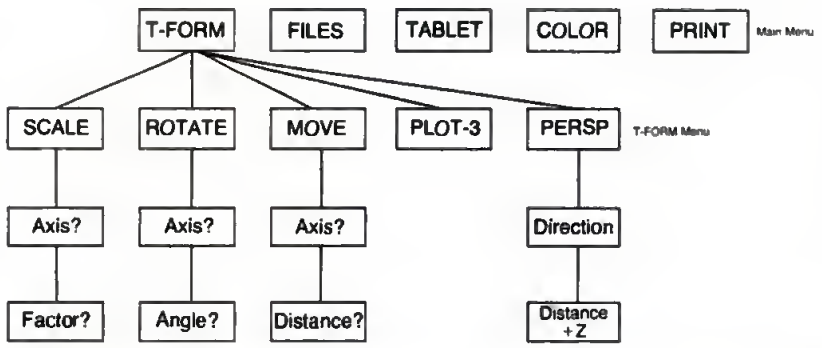
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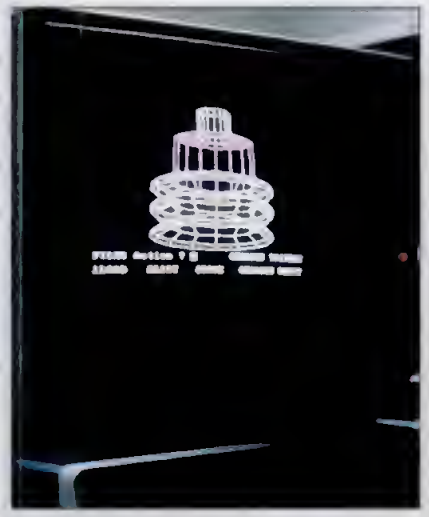

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The software's menu-driven system prompts you for all necessary information, beginning with a main menu that provides five options (see Figure 1).

The first option, T-FORM (Transform Menu), allows you to perform a variety of operations, such as scaling (increasing or decreasing an object along any one or all three axes), rotating, and moving. In T-FORM, you can also plot three simultaneous projections from the X positive, Y negative, and Z positive axes, and can view data in any of six perspectives. (Details of T-FORM's menu options are included in Figure 1.)

*Figure 1: Main menu and details of T-FORM menu for Space Graphics software.*



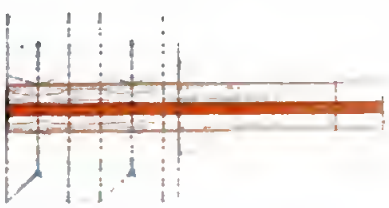
*A single ring structure can be colored purple to identify it as an active component. This component can be manipulated independently of the rest of the figure.*

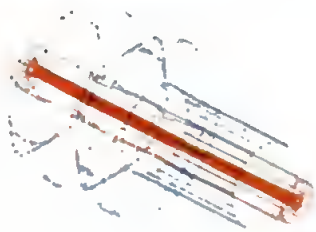


*The ring structure that was active in the previous display has now been scaled down.*



*The original image of the pulley has been manipulated by rotating it 90 degrees and by scaling it an arbitrary amount along a single axis.*





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Main menu option 2, FILES, provides the opportunity to access and edit object files. The coordinates of the points that define a wireframe figure are available from an ASCII file. With option 3, you can control the Space Tablet itself in order to perform digitization. The fourth option, COLOR, allows you to add four colors (green, violet, white, and black) to a given picture. PRINT, the fifth option, dumps figures drawn on the screen onto an Epson MX-80 or MX-100 printer.

The main menu, and the subsequent menus, make maximum use of the function keys on the PC keyboard. You do not have to type in the full name of an option or remember its letter code since each option is described on the screen and may be selected by pressing a single function key. Pressing the Enter key or F10 at any time will return you to the main menu.

### Advanced Software

The most recent version of *Advanced Space Graphics* software gives tha Space Tablet naw capabilities. You can design, digitize, and automatically dimension the wireframe objects that the Space Tablet gen-

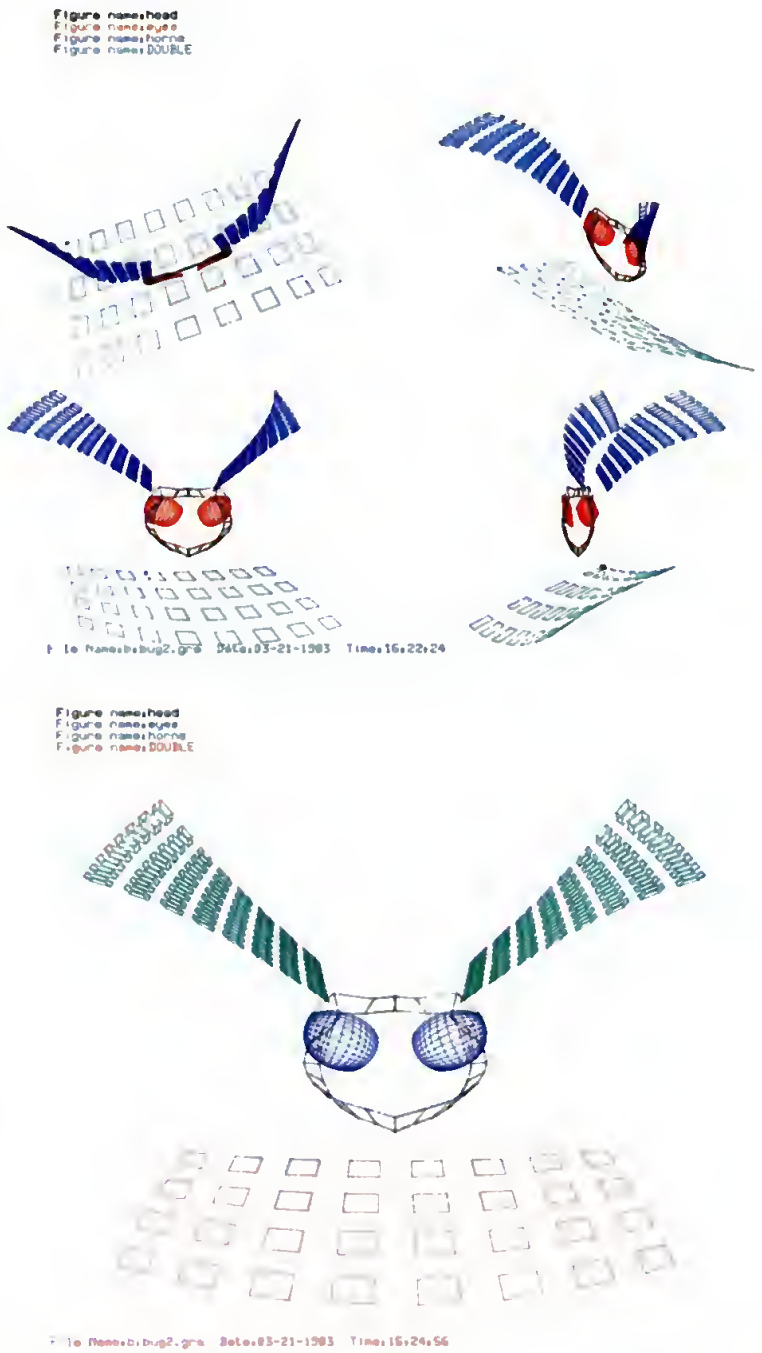
***ADVANCED Space Graphics software allows you to design, digitize, and automatically dimension the wireframe objects that the Space Tablet generates.***

erates. MCS software can also manipulate data generated by keying in coordinates or by using two-dimensional tablets.

Using *Advanced Space Graphics* software, you can duplicate existing components or develop mirror images of them. You can also draw arcs and circles and stack the circles to generate cylinders and cones with surfaces of revolution. Some programs can be used to construct a wire-

## Look! Up in the Sky! It's 3-D!

*A three-dimensional image created and stored with the Advanced Space Graphics software can be manipulated at will. These plotted pictures of a horned head flying over a field of squares are the same image as seen from different viewpoints in space.*

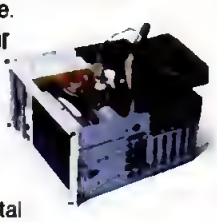




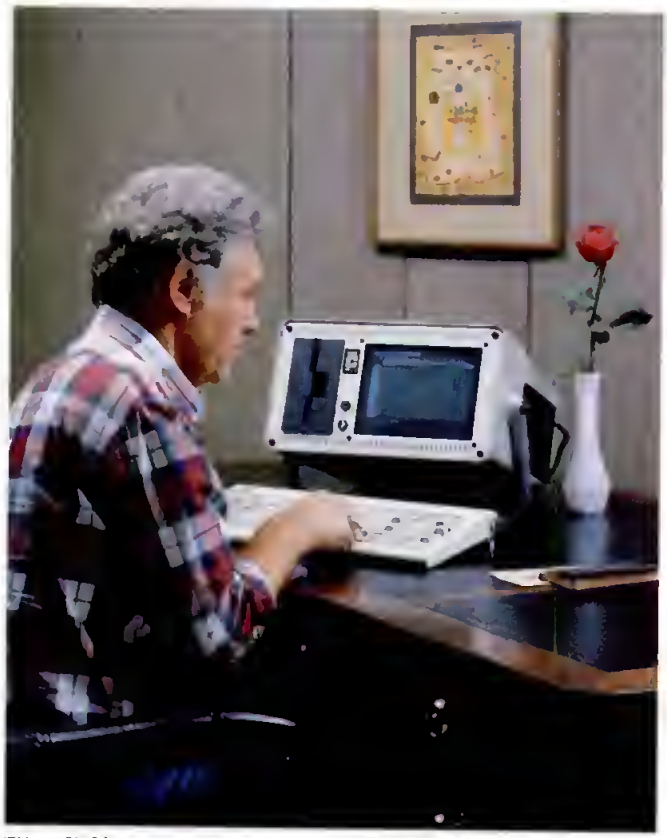
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frame object, display it from the top, sida, and front, and add text to it. Other programs can draw angles or lines in five ways, and allow you to watch tham changa as you alter the drawing. Advanced Spoce Graphics software can be used to drive plotters as well as printers, such as tha IBM XY/750, tha Hawlett-Packard 7470A, and the Houston Instruments HI/PLOT.

*DELSON digitizes the skulls of fossil monkeys to study the evolutionary relationships between different species.*

MCS elso markets a Spoce Communicotions software package that can transmit three-dimensional drawings through telephone lines to other users.

### Digitizing Skulls

Interactive three-dimensional input, as providad through tha Spaca Tablet, is an effective mathod of modaling irregular surfaces that cannot be represented through the mathematical equations most software can parform. Dr. Timothy Hart, a prosthodontist from Kanosha, Wisconsin, uses the Space Tablet for cephalometric analysis, tha measuring of a patiant's jaw and skull for orthodontic purposes.

Tha Space Tablet's ability to digitize skulls also plays an important rola in the anthropological studias conductad by Eric Delson at the Amarican Museum of Natural History in Naw York. A reseerch associate in the Department of Vertebrate Paleontology, Delson digitizes the skulls of fossil monkeys to study the evolutionary relationships between different specias. He plans to use this data to date tha sites from which the fossils were taken.

### Laser Cutting

Gamata Corporation uses the Space Tablat as e supplament to its own PC-based laser cutting machinery. Gamata's cliant, a plastics manufecturing shop, had used traditional mathods to cut, modify, and assemble plastic parts prior to its adoption of the laser cutting tool. The old procedure required laying out patterns on sheets of flat plastic, which were than cut with hend tools; completing these parts used to take about one week. Following the implamentation of tha PC-based systam, however, the typical cycla time was reduced to lass than one day.

The primary benafit of the PC/Space Tablet system is that it allows direct interaction between the product designer and the completed part. The product designer can now construct the part in three-dimansional detail on tha RGB monitor, create e test volume sample, and look for any changes in dimensions that indicate intarfarence. The modaled cut files can than ba saved on disk and sent to the laser cutter, where parts can be cut immediately.

### Engineering Applications

One of the primary applications for the Space Tablet/Space Graphics systam is in engineering design.

Russell Berger, an acoustical engineer with Joyner-Pelton-Rose, Inc., of Dallas, Texas, has been using the system to design public address systems. Bergar must essamble a cluster of speakers and horns that will direct sound at a certain pressure laval to a specific seating area. He predicts the sound field and chooses horns that will provide the proper sound coverage. Sometimas 20 or more different horns are required; each must be rotated into its respective X, Y, and Z axis position above the floor, and then assembled into a cluster.

To simplify this procedura, Bergar uses the Space Tablet's software to call modeled horns from a file, either individually or together. The horns are then scalad, moved, or rotated into their propar positions. Next, Berger prints plan and section views, using the Tablet to detarmina tha proper acoustical shape of tha audio control room, a critical factor in obtaining good audio reproduction.

### Educational Applications

The Space Tablet/Space Graphics systam is also being usad to introduce students of all ages to computer-aided design (CAD) on microcomputars. Tha system is gaining acceptance at colleges and universities as a means of introducing students to quantitative and qualitative CAD. Sev-


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eral high schools are also using the system to produce CAD simulations.

Robert Silverman, director of Industrial Arts and Homa Economics for tha Northport School District of Long Island, Naw York, saes the Space Tablat as a means of acquainting high scbool students with a technology they will use in the future. He wrote a 40-paga workbook that instructs students in tbe operation and application of the Space Tablet; it relates their axpariancas at each step to what might be encountered in an industrial level CAD problem.

Silverman rotates each student from his regular class into a week-long CAD simulation program and checks the progress of each studant by reviawing printouts of each one's wireframe drawings. "It's an excellant way to prepare studants for the futura of industrial design, and it extends the concept of computer literacy to graphics as well," Silverman said. He added that schools can obtain fadaral grants for this purpose through the Federal Vocational Education Act (94-484).

College students ara using the Space Tablat/Spoce Graphics system as a conceptual tool for computer-aided design and as an analytical tool for molecular modeling, cell structure analysis, mathematics, and medical mapping. At the Systems Science Institute at the University of Louisville, Kantucky, the system is used

***GAMATA Corporation uses the Space Tablet as a supplement to its own PC-based laser cutting machinery.***

to introduce graduata students to conceptual design.

Ken Powell, chief executive officar of Etude Concepts, an executive seminar workshop in Chappaqua, New York, usas the Space Tablet to teach executives about the technology of the future. "Wa lika to give executives an example of what's coming down the line in technology," Powell

said, "The Space Tablet lets them interact with computer graphics in short order. We've been pleasantly surprised as to how far they can actually go with it."

**The 3-D Future**

The Space Tablet/Space Graphics system has made the PC into a capable tool for many applications that were previously outside its reach. In developing this advance in microcomputer technology, Livingston Davies and Peter Smith of MCS were guided by two concepts.

*THE SPACE Tablet/Space Graphics system is also being used to introduce students of all ages to computer-aided design on microcomputers.*

The first is that most people find it more natural to think in 3-D. Up to now, engineers, architects, scientists, and artists were limited by having to represent their ideas in only two dimensions. The MCS system now gives them the opportunity to recreate their three-dimensional ideas and materials digitally and work with them in a computerized form.

The second concept is that microcomputers can perform very sophisticated graphics and information processing. The Space Tablet has made good on this belief by providing a capability for microcomputers that did not exist before.

The PC is starting to be taken seriously in fields such as computer-aided design, thanks to successful pioneering at MCS. Remember the effect that the introduction of *VisiCalc* had on the use of personal computers in business. Now that the PC has broken into the third dimension with the Space Tablet, we can imagine a different future for microcomputer graphics, shaped by MCS and its coming competitors. */PC*

*Barbara Luke Solsky is a New York City-area free-lance writer and editor.*


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As you well know, the IBM Personal Computer is proving to be the success story of the 1980s. Only 18 months after its introduction, the IBM Personal Computer commands almost a fifth of all personal computer sales—a remarkable achievement. At present the number of IBM Personal Computers in users' hands exceeds a quarter-million, with perhaps as many as half a million on the way in the next 12 months.

But despite its widespread public acceptance and the wealth of products now available to support it, we are convinced that vast areas of its potential remain unexplored, not to mention those products waiting to be introduced for which the IBM Personal Computer is the precursor.

For those serious enough about microcomputers to accept the challenge, the IBM Personal Computer represents a host of untapped possibilities.

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The readership of *PC* Magazine has, in the last year, grown at a rate to match the success of the IBM Personal Computer itself. But as the number of committed readers has expanded, so has that portion of users who are not only interested in *output*—that is, using the IBM Personal Computer to better solve problems—but who care deeply about the *process* of the computer itself.

We consider you to be among that select group of readers. Your relationship with microcomputers, vocational or otherwise, has led you to levels of technical competence and curiosity which go far beyond problem-solving. In effect, you have a compelling interest not only in *what* your IBM Personal Computer does, but also *how* it does it and how it can do more.

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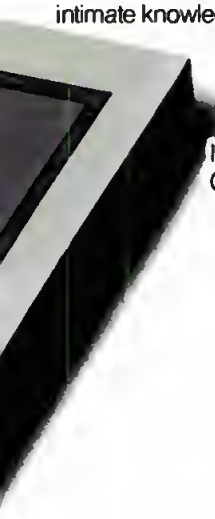
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- *Plus a range of articles on networks, mass storage and important user development tools.*

Moreover, as *PC Tech Journal* evolves, it is our explicit intent that you, our readers, play an important part in shaping the magazine. For we are convinced that it will be you who shape the future usefulness of the IBM Personal Computer itself.

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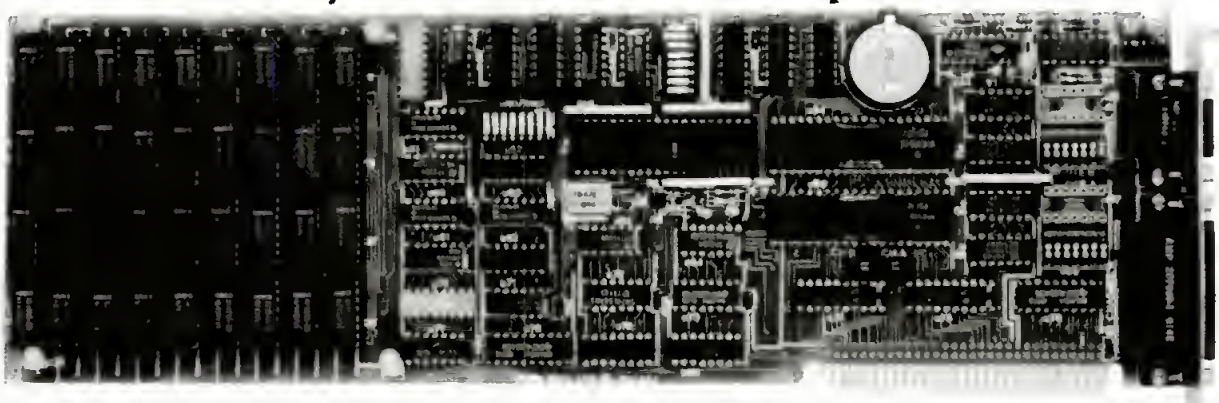
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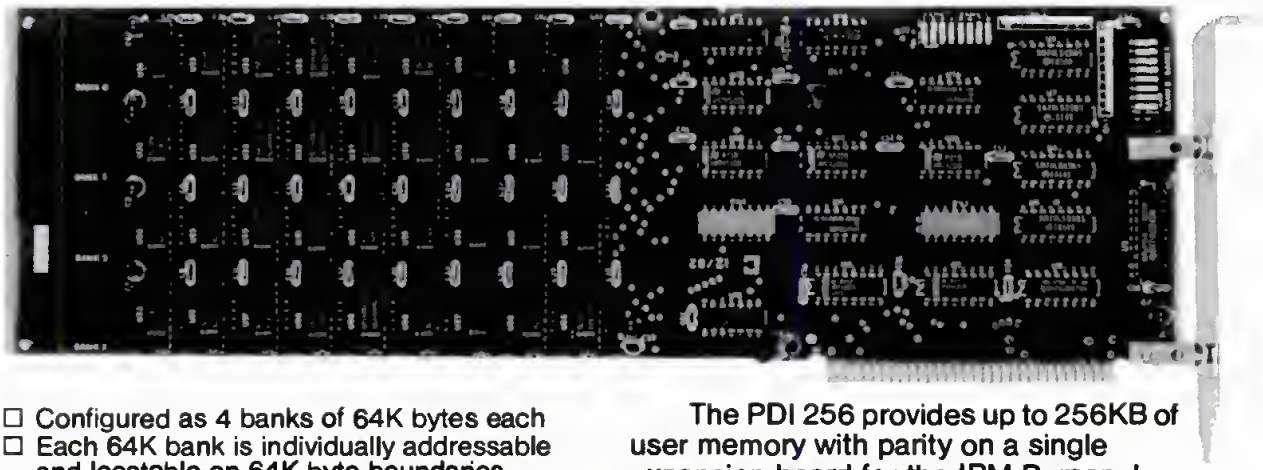
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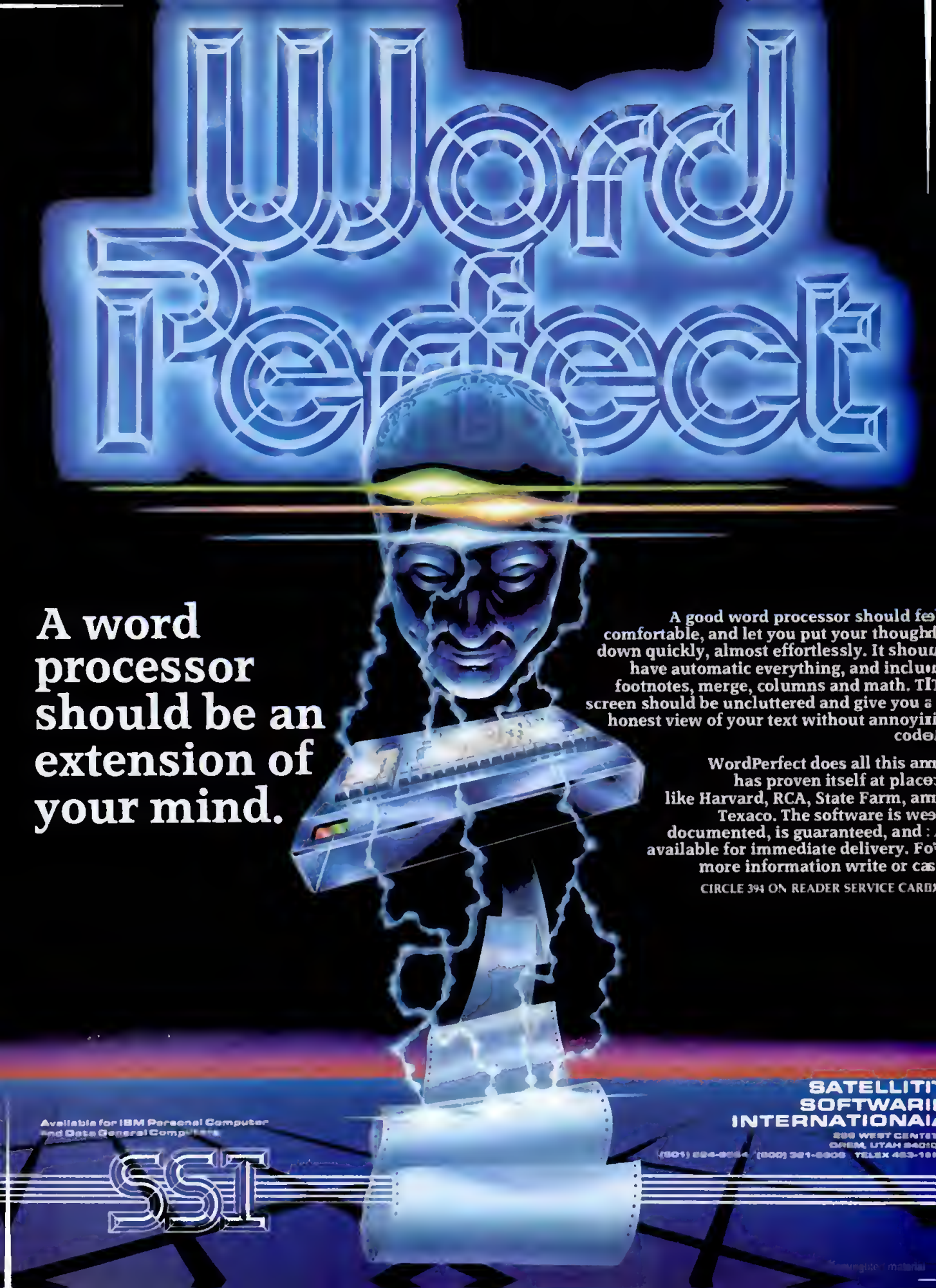
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| PS3276/Blayn Emulator | 1295 | 1150 |
| **AMDEK** Dual 3" Amdisk (2) Hitachi DS (250K) | 899 | 649 |
| **AST Megaplus" Card** | | |
| P/N MG-064 64K Ser, Clk | 595 | 449 |
| P/N MG-064SP, add'l Ser, Par | 695 | 499 |
| P/N MG-256, 256K Ser Clk | 995 | 695 |
| P/N MG-256SP add'l Ser, Par | 1095 | 749 |
| **AST Communications** | | |
| AST-3760 Bisync/SDLC/HDLC | 945 | 789 |
| CC-232 Comm Card | 295 | 235 |
| AST-3270 SNA Emul w/CC332 | 895 | 799 |
| **AST I/D Plus" Card** | | |
| P/N I/O-SP Clk, (2) Ser Par | 265 | 199 |
| **AST Combo Plus" Card** | | |
| P/N MC256SPC 256K, clk, P/S | 995 | 995 |
| **AST PC Disk++" Card** | | |
| P/N MD-064 64K, Host, Par | 555 | 495 |
| **CACTUS TECHNOLOGY** | | |
| 200 Baud Direct Modum | 349 | 299 |
| **COEX** | | |
| Extender Card | 40 | 19 |
| Prototype Card | 69 | 42 |
| 37 Pin "D" Connector | 19 | 8 |
| Snap-in Card Guides (S) | 8 | 5 |
| **CORONA Hard Disk System** | | Call |
| **CORVUS Hard Disk System** | | Call |
| **DAVONO** | | |
| 5Mb Hard Disk | 1995 | 1490 |
| 12Mb Hard Disk | 2495 | 2295 |
| **MAYNARD Disk Drive Card** | | |
| Floppy Card w/Parallel | 295 | 249 |
| Floppy Card w/Serial | 325 | 260 |
| **ORCHID** | | |
| Hi-Res Graphics Adapter | 495 | 429 |
| **PERSYST Spectrum (64-256K)** | | |
| P/N SPS4-CCP, 64K, S, S, P | | 499 |
| P/N SP64 64K | | 375 |
| 64K Upgrade Kit (9 chips) | 130 | 50 |
| **QUADRAM Quadboard (64-256K)** | | |
| P/N Q64 64K w/4 functions | 595 | 429 |
| **TANDON** TM 100-1 (160K) | 295 | 195 |
| TM 100-2 (320K) | 395 | 269 |
| **TG PRODUCTS** Joystick | 65 | 49 |
| Track Ball | 65 | 52 |
| **VISTA "Multicard"" (exp 64-256K)** | | |
| P/N V-064 64K | 395 | 249 |
| P/N V-064PSC 256K w/PSC | 495 | 299 |
| 64K Upgrade Kit (9 chips) | | 50 |
| "MAXICARD"" 576K | 1295 | 999 |
| "PC MASTER"" 7 I/O's | 569 | 485 |
| DISKMASTER, handles 5¼", S and Cartridge Floppies | 349 | 249 |
| **XEDEX** Baby Blue CP/M | 600 | 445 |

## PRINTERS

| | | |
|---|---|---|
| **COEX** 50F/T 50cps | $499 | $299 |
| **STAR MICRONICS - NEW!** | | |
| Gemini 10 100cps | 499 | 379 |
| Gemini 15 15 | 649 | 479 |
| **OTC** Daisywhl w/48K Buf | 1450 | 1049 |
| **EPSON** MX80 | 645 | 429 |
| MX80F/T | 695 | 499 |
| MX100 | 895 | 649 |
| FX80 | 699 | 549 |
| **INTEGRAL DATA** | | |
| Microprism 480 | 799 | 599 |
| Prism 80 Color (all) | 1795 | 1495 |
| Prism 132 Color (all) | 1995 | 1695 |
| **BROTHER** HR-1 | 1195 | 895 |
| Daisywriter | 1495 | 1295 |
| **IBM** PC to EPSON Cable | 60 | 45 |
| **OKIDATA** Microline 82A | 599 | 479 |
| Microline 83A | 899 | 729 |
| Microline 84AP | 1399 | 1099 |
| Okidata 92 | 699 | 549 |

## MONITORS

| | | |
|---|---|---|
| **AMDEK CORP** | | |
| 300 Green 12" | $139 | $155 |
| 310 Amber 12" | 210 | 175 |
| Color I Composite | 399 | 339 |
| Color II RGB Hi-Res | 899 | 790 |
| Color III RGB Comm'l | | Call |
| Color IV RGB Analog | 1299 | 1059 |
| **NEC** 12" Green -**NEW** | 199 | 155 |
| 12" RGB (690 x 230) | 895 | 799 |
| **PRINCETON GRAPHICS** | | |
| RGB IBM Lookalike | 700 | 599 |

## DISKETTES for IBM PC

| | | |
|---|---|---|
| **DYSAN** 5¼" SS SD | 10/$55 | $39 |
| **DYSAN** 5¼" DS SD | 10/65 | 48 |
| **ISM** 5¼" SS SD | 10/80 | 43 |
| **IBM** 5¼" SS DD | 10/65 | 47 |
| **VERBATIM** 525-01 SS | 10/45 | 23 |
| **VERBATIM** 550-01 DS | 10/55 | 34 |
| **MAXELL** MD1 SS | 10/50 | 29 |
| **MAXELL** MD2 DS | 10/60 | 36 |
| **Flip Box** 5¼" (80 disks) | | 14 |
| **BULK SPECIAL** SS | 10/25 | 10 |
| With Sleeve and Box | 100/195 | 145 |

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|---|---|---|
| **CURTIS** PC Pedestal | $80 | $65 |
| Extension Cable | 50 | 44 |
| **INTEL** 8087 IC | | 199 |
| **RAM EXPANSION** | | |
| 16K Motherboard (18 IC's) | | 19 |
| 64K Memory Exp (9 IC's) | | 50 |
| **KRAFT** IBM Joystick | 70 | 49 |
| IBM Paddles | 50 | 40 |

## SOFTWARE

### BUSINESS

| | List | ACP |
|---|---|---|
| **ASHTON-TATE** | | |
| dBase II for CP/M86" 128K | $700 | $445 |
| dBase II for PC-DOS 128K | 700 | 445 |
| **APPLIED SOFTWARE TECHNOLOGY** | | |
| Versaform | 390 | 259 |
| **BEST PROGRAMS** | | |
| Personal Finance Program | 95 | 85 |
| **CDMSHARE TARGET** | | |
| Target Planner Calc | | Call |
| **CONSULTANT SYSTEMS** | | |
| The Real Estate Consultant | 275 | 225 |
| **DATAMOST** | | |
| Real Estate Investment | 130 | 99 |
| Write-on IBM | 130 | 99 |
| **DENVER SOFTWARE** | | |
| Executive Acct Sys (easy) | 725 | 555 |
| **EAGLE SOFTWARE** | | |
| Money Decisions | 150 | 130 |
| **FINANCIER** Personal Series | 195 | 179 |
| Tax Series | 130 | 119 |
| **HDWARDSOFT** | | |
| Real Estate Analyzer | 250 | 189 |
| **INFORMATION UNLIMITED** | | |
| Easywriter II Word Proc | 350 | 255 |
| Easyfiler Data Base | 400 | 295 |
| Easyspeller 58K Words | 225 | 160 |
| Easyplanner | 250 | 195 |
| **INNOVATIVE SOFTWARE** | | |
| T I M III Data Base | 495 | 365 |
| **INSOFT** | | |
| Data Design Data Base | 225 | 175 |
| **ISA** Spellguard | 295 | 225 |
| **ISM** Math Magic | 90 | 70 |
| Graph Magic | 90 | 70 |
| Graph/Math Combo | 160 | 115 |
| **LEXISOFT** Spellbinder | 495 | 250 |
| **LIFETREE SOFTWARE** | | |
| Volkswriter | 195 | 195 |
| **MICRO INVESTMENT** | | |
| Stock Chart II | | Call |
| **MICRO LAS** Tax Manager | 250 | 190 |
| **MICROCOM** Microterminal | 100 | 95 |
| **MICRO PRO** Wordstar" | 495 | 285 |
| Spellstar" | 250 | 199 |
| Mailmerge" | 250 | 199 |
| **MICROSOFT** | | |
| Multiplan" MS-DOS | 275 | 190 |
| **NO AMERICAN BUS SYSTEM** | | |
| The Answer | 250 | 199 |
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| Visualize | 100 | 73 |
| **OWL** Text Plus Exec. Info Sys | 240 | 215 |
| **PEACHTREE** | | |
| Peach Pak 4 (GL, AR, AP) | 595 | 390 |
| **PERFECT SOFTWARE** | | |
| Perfect Writer" | 389 | 239 |
| Perfect Speller" | 189 | 120 |
| Perfect Filer" | 289 | 179 |
| **SELECT** Select WP | 595 | 337 |
| **SORCIM** Supercalc" | 295 | 179 |
| Superwriter" | 395 | 260 |
| **SYNERGISTIC** Data Reporter | 250 | 195 |
| **VISICORP** | | |
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| Visitrend/Visiplot" | 300 | 219 |
| Visidex" | 250 | 199 |
| Visifile" | 300 | 219 |
| Visischedule" | 300 | 219 |
| Visiterm" | 125 | 95 |
| Desktop Plan 1 | 300 | 235 |
| Business Forecasting Model | 100 | 79 |

### IBM PC UTILITIES

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|---|---|---|
| **COMPUTER INNOVATIONS** | | |
| C86C Compiler | 395 | 369 |
| **EMERGING TECHNOLOGY CONSULTANTS, INC.** EDIX Editor | 195 | 179 |
| COPY II Plus Utility | 40 | 32 |
| **DATA CAPTURE** | | |
| Data Capture PC | 120 | 99 |
| **NAOY SYSTEM** | | |
| Copy PC Backup | 35 | 30 |
| **NORELL** Bit Copier | 50 | 37 |
| **NORTON** Utilities(14 progs.) | 80 | 68 |

### PERSONAL/ENTERTAINMENT

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|---|---|---|
| **AUTOMATED SIMULATIONS** | | |
| Temple of Apshai | $40 | $30 |
| Oil Barons | 100 | 75 |
| **BRODERBUND** Apple Panic | 30 | 22 |
| **CAVALIER** Champ Blackjack | 40 | 32 |
| **CONTINENTAL** Home acct+ | 150 | 115 |
| **DATAMOST** Pig Pen | 30 | 22 |
| Space Strike | 30 | 22 |
| **INFOCOM** | | |
| Zork I, II, or III | 40 | 30 |
| Ulysses Golden Fleece | 35 | 26 |
| Doll Challenge | 25 | 19 |
| Deadline | 50 | 38 |
| **FRIENDLYWARE** PC Intro Set consists of Disk 1, PC Intro + Games, Disk 2, 13 Games, Disk 3, 6 Business Progs. | 49 | 40 |



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| | List | ACP |
|---|---|---|
| 1. **VISTA** "maxicard" 576K (exp 64K to 576K) with Dynadisk | | |
| FREE SUPERCALC — **Version A.** "maxicard" with 64K and Dynadisk" | $379 | $299 |
| **Version B.** "maxicard" with 576K and Dynadisk" | 1299 | |
| "Supercalc" Electronic Spread Sheet | 299 | |
| Total | 1598 | $999 |
| 2. **VISTA** "PC master" Multi-function I/O (7 Functions) | 595 | $495 |
| 3. **TEAC or SHUGART** Half-High Double-Sided Drives (320K) | 399 | $299 |

## TRAINING for IBM PC

- Interactive Training Disks
- Step by Step in English
- Handy Reference Guide

| | | |
|---|---|---|
| PLAN POWER-Visicalc | 75 | 59 |
| PLAN POWER-Supercalc | 75 | 59 |
| PLAN POWER-Multiplan | 75 | 59 |
| DB POWER-dBase II | 75 | 59 |
| POWER PACK-Wordstar | 75 | 59 |
| ATI POWER-IBM DOS | 75 | 59 |
| BASIC POWER-IBM MBASIC | 75 | 59 |

## MODEMS

| | List | ACP |
|---|---|---|
| **SIONALMAN** Mark I (RS232) | $99 | $79 |
| **HAYES** | | |
| Smartmodem (RS232) | 269 | 225 |
| Smartmodem 1200 | 999 | 549 |
| **IBM** PC to Modem Cable | 40 | 30 |

## FLOPPY DISKS FOR IBM PC

| | |
|---|---|
| **TEAC** DSDD (320K) | $299 |
| **TANDON** TM-100-2 | 269 |
| **SHUGART** DSDD (12" high) | 299 |
| **QUME** DSDD (12" high) | 299 |

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Signature_____

Name_____

Address_____

City_____ State_____ Zip_____

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| 1040 EZ | 2119 |
| 1040 page 1 & 2 | 2210 |
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| Schedule B | 2441 |
| Schedule C | 3468 |
| Schedule D | 3903 |
| Schedule E | 4137 |
| Schedule F | 4684 |
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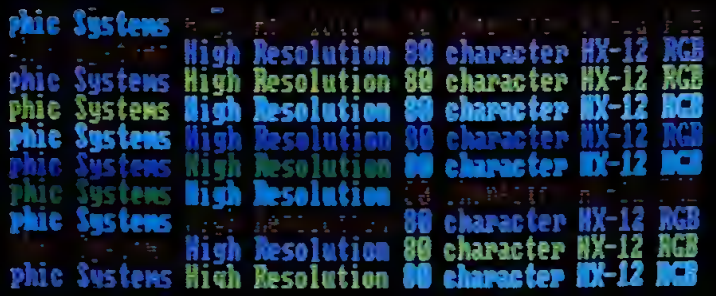
# High Resolution RGB Color Monitor Designed for the IBM Personal Computer

## FEATURES

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- ☐ 690 dots horizontal resolution
- ☐ 16 colors
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- ☐ plugs directly to IBM PC, cable supplied
- ☐ FCC Class B Approved



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80 character display

**PGS** ***Princeton Graphic Systems***

1101-I State Road ☐ Princeton, New Jersey 08540 ☐ (609) 683 1660 ☐ TLX: 685 7009 PGS Prin.

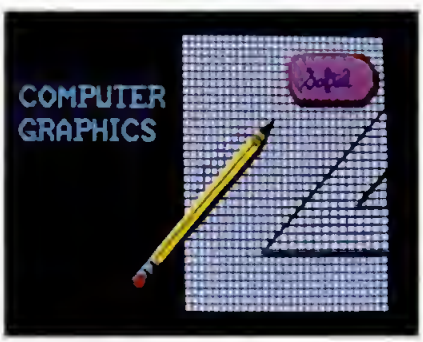
CIRCLE 209 ON READER SERVICE CARD

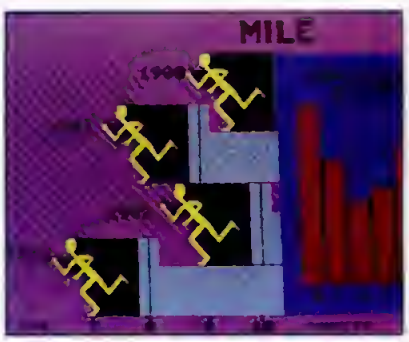
*A new generation of high-performance graphics boards is hitting the PC market. Videogram is one of the first programs to exploit the power of this talented hardware.*

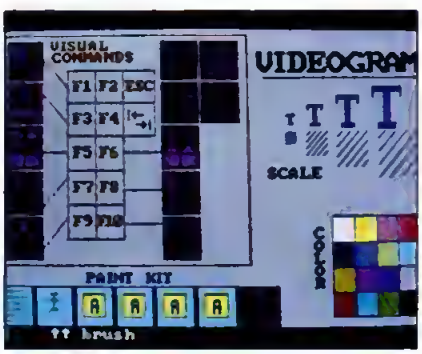
# ONE PICTURE IS WORTH A

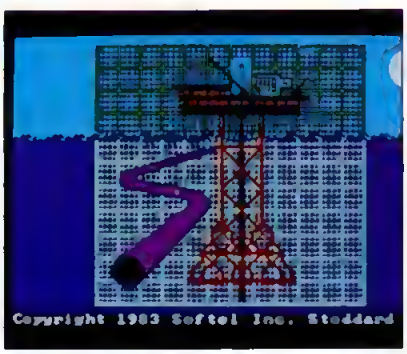
Videogram
Softel, Inc.
Box 257
Stoddard, NH 03464
(212) 677-6599
**List Price:** Videogram only, $300; Videogram with Plantronics Colorplus graphics board, $525.
**Requires:** 64K, one disk drive, color monitor.

CIRCLE 592 ON READER SERVICE CARD



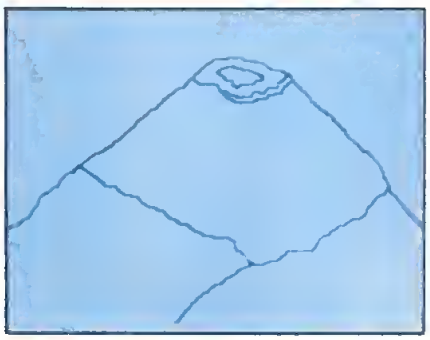




Computers are capeble of producing extraordinary graphic images. We've all probably seen the riveting NASA pictures of Saturn and Jupiter, or the surreal computer animations in recent films and television commercials. While these impressive visuals have been created on large meinframes, the technology is rapidly sifting down to smeller systems.

The ability of a microcomputer to handle graphics is becoming an increasingly important consideration for prospective purchasers. Most businessmen agree that charts and graphs can communicete deta with far greater speed and impact than tables of figures. And computers can produce slides and ettention-getting figures that add life to staid presentations at sales meetings and trade shows. Architects, engineers, and designers of all sorts are learning to use their PCs to help create and sell their products.

IBM originally brought out the PC with two boards: one for monochrome monitors and the other for either a television type monitor or a high-resolution RGB monitor. Both boards can handle graphics, but while the color board can build up complex images dot-by-dot, monochrome graphics must ordinariiy be constructed entirely from ASCII characters (primarily the special high-bit graphics set with ASCII numbers from 128 through 255). However, two hardware suppliers, Hercules Computer Technology and Orchid Technology, each manufacture special monochrome graphics boards that allow high-resolution pixel-by-pixel graphics on the monochrome screen, and e new generation of boards that can handle both color and monochrome graphics is starting to hit the market.

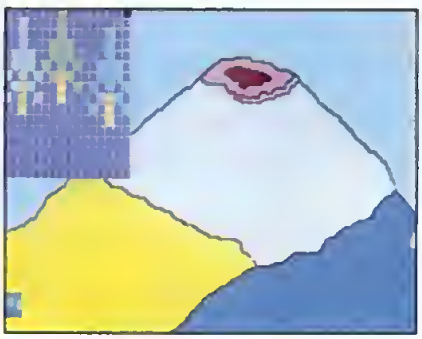
# 100,000 Bits



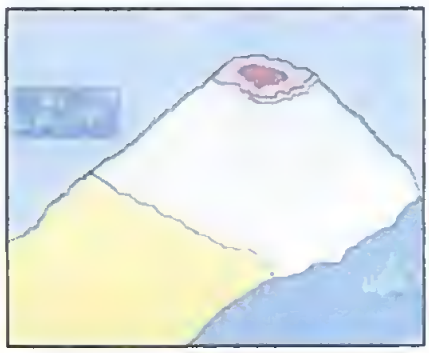
*An outline of the volcano is drawn in one foreground color on a different background color.*



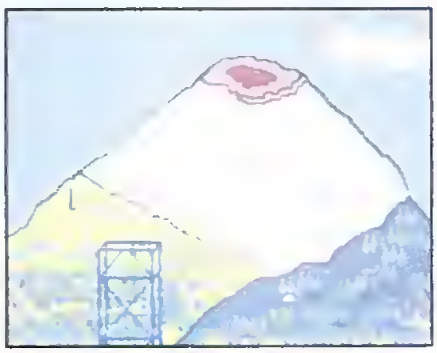
*Five additional foreground colors are painted on.*



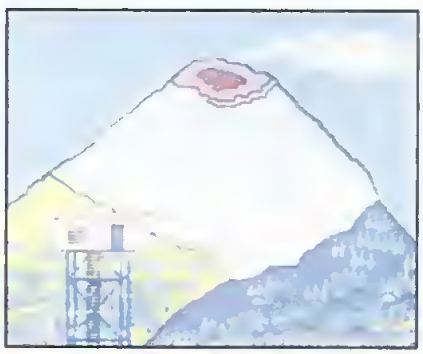
*Trees are created using the zoom feature that allows pixel-by-pixel color manipulation.*



*The initial tree grouping is moved and copied to other parts of the image.*



*Additional groups of trees, the outline of a smoke cloud, and a line drawing of the fire tower are added.*



*The outline of a smoke cloud and a line drawing of the fire tower are added.*

## Image Processing

*This sequence of screens shows the steps involved in creating a composite image using Videogram software and the Plantronics color board.*

### Addressing the Issue

While there has been a proliferation of new graphics hardware such as better graphics boards, cheaper high-performance monitors, and a wealth of input digitizing devices, graphics software has lagged far behind. Some of this is the result of the relative difficulty in graphics programming. BASICA and Pascal provide many graphics functions, but these are fairly slow and often hard to use. Drawing a complicated image often requires tedious dot-by-dot or segment-by-segment addressing. And for certain ad-




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vanced applications, the programmer must know how to access such graphics controller chips as the IBM's Motorola 6845 directly.

Many viewers of commercial television feel that certain well-produced commercials have far more visual impact than the programs surrounding them. The producers of these commercials know the value of dazzling computer graphics and animation—they want to glue you to your seat so you don't scurry off to the refrigerator. And they have the resources to hire the most talented computer artists and the best-equipped graphics studios.

***NEW ADD-ON boards can produce animations that would have turned heads two or three years ago.***

With a properly equipped system, any IBM PC user can produce images of impressive quality, capture them on color slides, and use them for advertising or display purposes. New add-on boards from companies such as Tecmar can even put successive screens onto individual videotape frames, producing animations that would have turned heads two or three years ago. But none of this is very easy at present. There are few decent graphics utility software packages on the market. And IBM-supplied hardware simply can't handle ultra-high resolution and hundreds of colors on the screen at once.

### Learning the Vocabulary

When IBM put together its first color graphics board for the PC it did a minimal job. Rather than produce hardware that would let users create Tron-quality images or the rapid animations used in television commercials, the Boca Raton design team assembled a board that let home users experiment to learn the vocabulary of computer graphics, and allowed businessmen to draw relatively uncomplicated bar graphs and pie charts.

The IBM color graphics board operates in two modes: one with an 80-character screen width and a maximum of 16 simultaneous colors, designed for text and primitive text graphics; the other with either a 40-character screen and a maximum of 4 colors or an 80-character screen in black and white, designed for true dot-by-dot graphics. The maximum resolution the PC can handle is 640 horizontal dots by 200 vertical dots, in one color against a black background. However, for true pixel-by-pixel color graphics, the PC hardware can deliver only 320 horizontal dots by 200 vertical dots and only 3 colors at one time (on top of one of 16 background colors).

In the 80-character text mode you can work with 16 different colors, but can display only combinations of the 256 ASCII characters stored in the PC's ROM. Although it is possible to use so many colors simultaneously, you can't address individual pixels on the screen. Another drawback is that in the IBM text mode you can't use any of the graphics commands and statements built into Microsoft BASIC, such as the ones that draw circles or boxes or even simple diagonal lines.

### Playing with Building Blocks

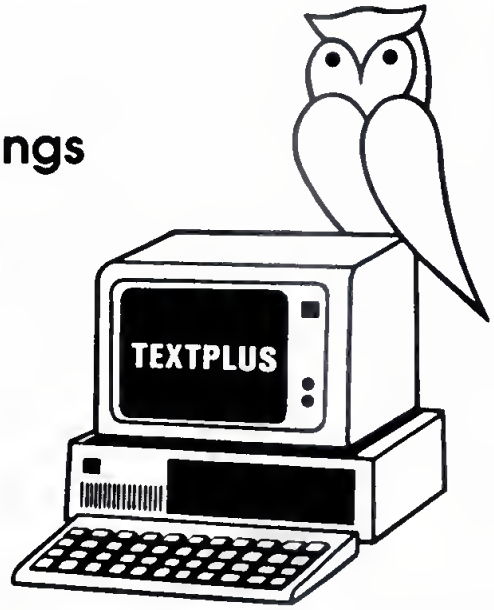
The text screen can manipulate 256 separate characters, and create images by using these characters as pictorial building blocks. You can draw several kinds of boxes and grids with little pieces of horizontal and vertical lines and the various intersections of such lines with the present character set. You can also use several rectangular shapes in combination with these lines to form complicated pictures. You can even use strings of certain letters and punctuation marks to create interesting pictures. But you are still constrained by the limited number of character building blocks available.

There are several commercial programs that allow you to create and store your own graphics-mode characters. These become new picture building blocks, and can be manipulated directly from the keyboard. The characters can easily be moved in BASIC programs by turning them into CHR$ strings and using the LOCATE statement to change their positions onscreen. However, you can do this only in the graphics mode, which limits you to three foreground colors. And since the PC prints all text in either white or yellow, and these custom-made character sets are treated like text, you can't use them with very much impact.

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A better trick is to decrease the number of dots you have to work with on the screen and at the same time increase the number of colors. What you sacrifice in the number of dot locations, you gain in the number of colors you can assign to each dot. The current IBM color graphics card can handle only 16,000 bytes of active screen memory. Since there are eight bits to a byte, you can work with a grand total of 128,000 (16,000 × 8) pieces of color and positioning information. This number sounds large, but doesn't actually amount to very much.

In the high resolution mode, which uses 640 pixels from left to right and 200 from top to bottom, you need all 640 × 200 bits of memory. And since each of these binary bits can only be turned off (=0) or turned on (=1), any high-resolution image can have only one foreground color against a black background color. While the IBM graphics board normally makes this foreground color white, you can give it any color you want by entering OUT 985,N where N is a number from 0 to 15 in IBM's color system.

The medium-resolution screen uses only 320 dots from left to right but the same 200 dots from top to bottom. Multiply 320 by 200 and you get 64,000, which is half of the available 128,000 bits of memory. The other 64,000 bits are used to put color on the screen, but you're limited to one of three foreground colors and one of 16 background colors. There simply isn't enough room to code more than that into the limited screen memory space available. And IBM's medium resolution color selection is not the best. You can use only two groups, or palettes, with three colors each, and these color combinations don't exactly send graphics artists into shivers of ecstasy.

*YOU'RE LIMITED to using two groups, or palettes, with three colors each; these color combinations don't exactly send graphics artists into shivers of ecstasy.*

### Painting by the Numbers

The reason for this is in the way IBM coded its colors. Its spectrum is only eight colors wide, and two of these colors are white and black. Ignore those and you're left with six. (Actually, each color can be displayed in high or low intensities, so you really have twelve colors plus two shades of black and two of white. The high-intensity white is so overpoweringly bright that you really can't do much with it, and the low-intensity black is effectively invisible.) The six basic colors are coded: 1=blue, 2=green, 3=light blue (which IBM calls "cyan"), 4=red, 5=purple (called "magenta"), and 6=brown.

*TO MAKE matters confusing, IBM calls bright, high-intensity colors "light" colors.*

This last color, brown (#6), is actually the low-intensity version of color #14, which is yellow. You can figure out what the high-intensity version of any color is by adding 8 to it. High-intensity red is color 12, since red is color 4. To make matters confusing, IBM calls these bright, high-intensity colors "light" colors. So the IBM BASIC manual calls color 9 "light blue" (remember, regular old blue is color 1). But color 9 is just a jazzed-up, brighter version of blue. On a precisely tuned color monitor such as IBM's own, the light colors do look a bit less rich or deep than the regular colors. But on most other screens the light colors look brighter and far more intense. And if your monitor can't read the intensity signal that governs character brightness, you won't see any difference. Color 1 will look exactly like color 9; color 2 exactly like color 10, etc.

In the medium resolution mode, however, you can't create images using the high-intensity colors. You can use both the high-intensity colors and the ordinary-

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intensity colors only in the background. But for foreground colors—the ones you draw or paint with—you are stuck with either green, red, and brown (colors 2, 4, and 6 on IBM's palette 0); or cyan (light blue), magenta (purple), end white (colors 1, 3, and 5 on palette 1). You can't mix palettes, so there is no way to draw a red line next to a blue line on the same medium resolution screen. Artists creating complicated Images must find ways to use these limited and bizarre color schemes without heving the result resemble a sixties psychedelic phantasmagoria.

Programming experts and tweak freaks have gotten around this stricture by using an additional mode, not mentioned in the BASIC manual, that gives users 16 colors and the ability to manipulate pixels directly on the screen. The IBM *Technical Reference* manual calls this the "low-resolution" mode, because you are limited to 160 horizontal and 100 vertical pixels. (Each low-res pixel is actually a 2-by-2 box of dots.) To use this feature, you must know how to program the Motorola 6845 CRT Controller chip on your graphics board. The IBM *Technicol Reference* manual edds that "many additional modes are possible with clever programming of the adepter [card]."

***THE BIG THRUST at the moment is to produce equipment aimed at business use.***

### Out of the Water

Most businessmen aren't interested in anything except punching a button or two and having the screen fill with eye-popping graphs, charts, and message slides. And to paraphrase Willie Sutton, that's where the money is. While hardware vendors may bring out devices that would let programmers fiddle with more colors or higher resolution than is currently available from IBM, the big thrust at the moment is to produce equipment aimed at husiness use.

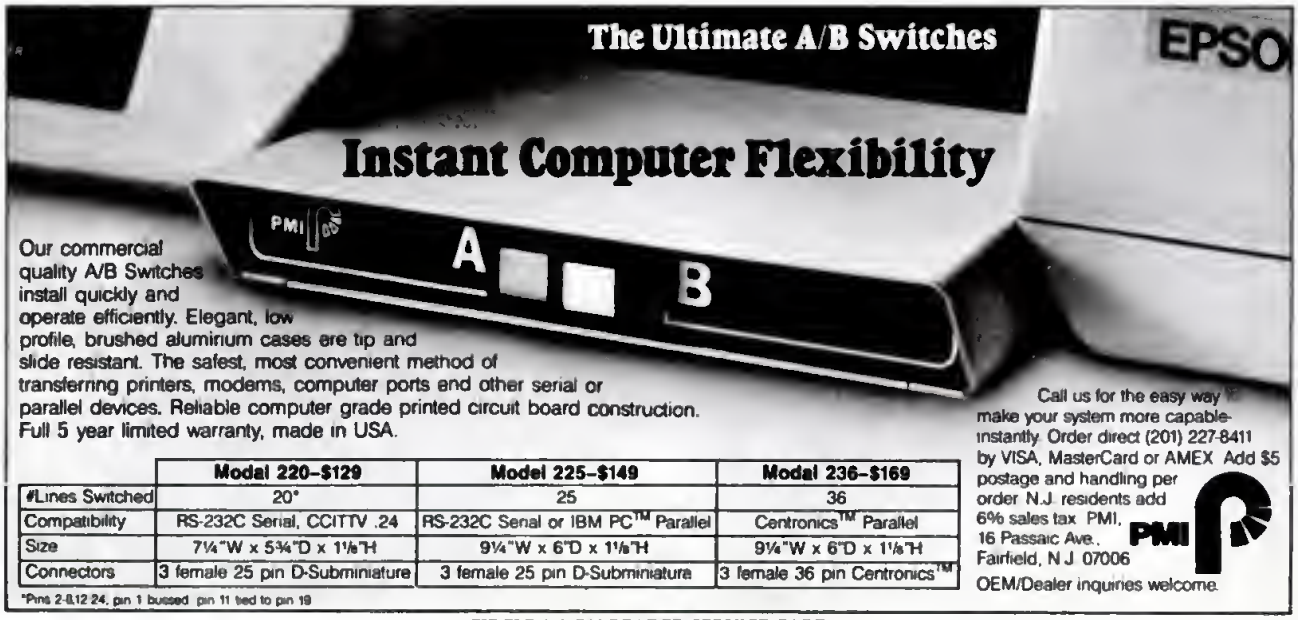
Enhenced business graphics are often referred to as "presentation graphics," since such images ere used primarily as electronic slide sbows at corporate sales or orgenizational meetings. A computer with sophisticated presentation graphics can switch from imege to image using such cinematic tricks as dissolves and wipes, and can displey logos and sales points with attention-getting highlighting and animetion. A well-done presentation graphics program can blow conventionel flip charts out of the water, and provoke applause for its technical virtuosity.

One of the most significant new areas of microcomputer development is likely to be in presentation-quality graphics. Most small-to-average businesses, and even many larger ones, simply do not have professionally staffed art departments thet can produce standard ink-and-paper images of sufficiently high quelity. But with advanced hardware and software, virtually any patient PC user can achieve impressive results using preset templates and edvanced one-key commands.

***YOU CAN USE combinations of letters and punctuation marks to create interesting pictures.***

Third-party bardware vendors have recognized that such dazzling displays were not really possible with the IBM color/graphics board, because of its limited resolution and the difficulty in working with only three colors locked into two inflexible palettes. The first non-IBM manufacturer to offer a more advanced board was Frederick Electronics. Its Plantronics Colorplus board fits in one PC expansion slot but acts like two overlapping IBM color graphics boards.

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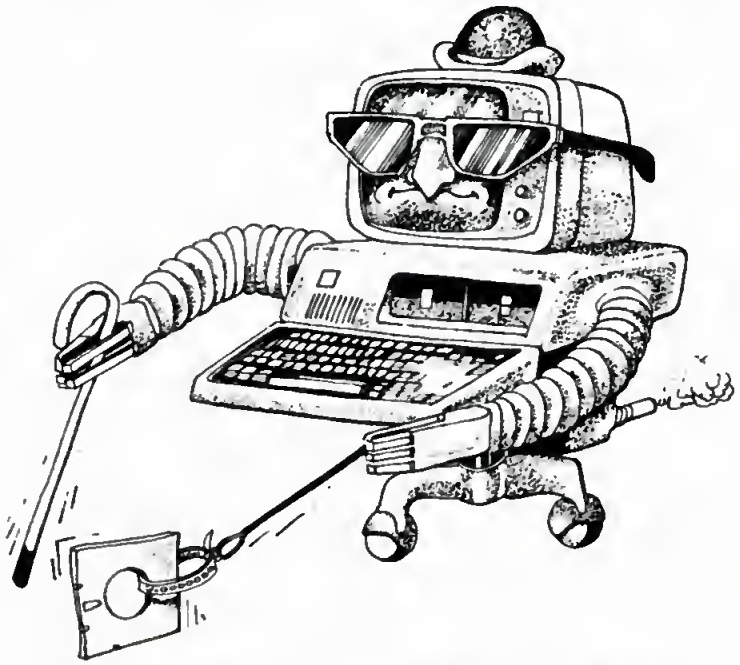
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320 by 200 resolution as the IBM board, but can put all of the PC's 16 colors on the graphics screen at one time. It originally sold for $995, but was reduced first to $750, and more recently to $475. While this may have been partly motivated by increased competition, an executive at Plantronics said a new fully automated manufacturing system, plus a tremendous number of orders in the pipeline, let them slash the price. He also predicted that prices for all manufacturers' color boards would continue to plummet, and added that manufacturers are scrambling to cram all the necessary circuitry onto one chip and soon may offer 16-color high-resolution graphics boards for as little as $150.

*THIN LINES actually do appear to quiver on the screen as the image alternates between the odd-numbered and even-numbered lines.*

Control Systems currently sells two ultra-high quality single-slot boards for the PC that can yield either 640 by 410 dots (its $1,595 version) or 1,024 by 1,024 dots (for a whopping $3,195). Its boards, as well as a new board from Scion, have analog outputs, and require special compatible monitors selling for $2,000 and up. Images produced with such expensive analog hardware on a micro system can be extraordinary. Improved lower-resolution digital boards have been announced by Quadram, Tecmar, Amdek, USI, and AST. Conographic Corporation's board will have IRGB digital, RGB analog, true NTSC, and channel-selectable RF outputs. And yes, one is expected shortly from IBM.

### My Friend Flicker

Several digital-output manufacturers claim that their boards will have 640 by 400 resolution. The only way for them to do this is to run the boards in an interlaced mode, which means the image may flicker annoyingly. The problem is that with 640 horizontal and 400 vertical dots, you just

can't funnel enough information fast enough through the available video pipeline. Ideally, boards should put 60 images on the screen each second. But with so many dots to address, these straining digital boards have to alternate putting the odd numbered lines on the screen 30 times a second and then the even numbered lines 30 times a second.

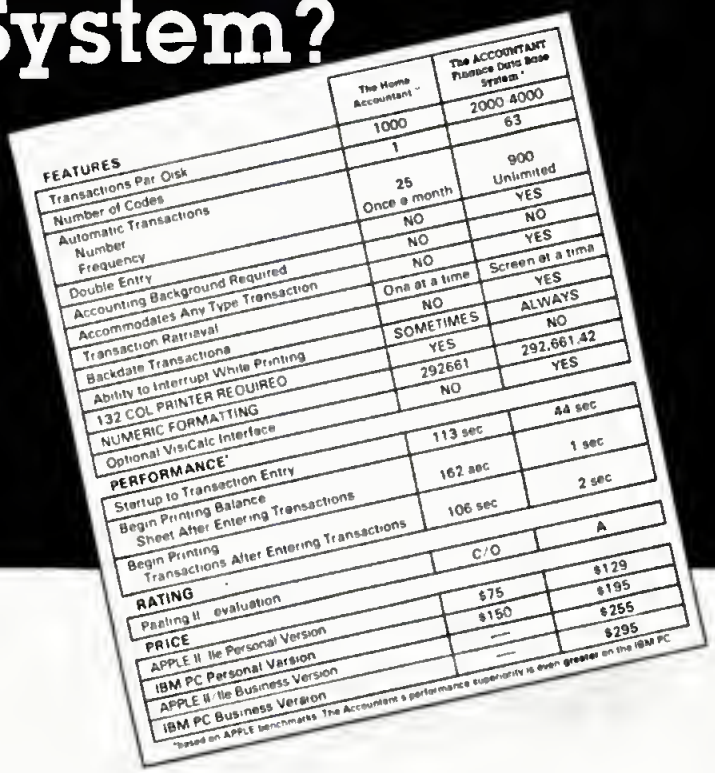
The human eye can't detect an image flickering at 60 times per second, but can discern one flickering at 30. For large, solid objects, this flicker is not readily apparent. But thin lines actually do appear to quiver on the screen as the image alternates between the 30 odd-numbered lines and the 30 even-numbered lines each second. If the boards had analog outputs, or if the monitors had long-persistence phosphors to blur the image slightly, such flicker problems could be eliminated. However, such hardware could be incompatible with existing IBM graphics software. Well, you can't have everything.

Some of the new boards will operate with both a color and IBM monochrome screen, but there are problems with this arrangement. Both boards use the same graphics memory area of the PC for mono and color monitor graphics, and the same output plugs. It is possible to have the output designed for a color monitor flash out into a misconnected monochrome monitor, or vice versa, with unpredictable and potentially destructive results.

Future boards may come with videotape interfaces that would allow users to create complex animations. Some board manufacturers claim their new offerings will boast far more than 16 simultaneous colors, and one, Conographic Corporation, says it will offer a vector graphics package that can draw certain figures onscreen up to several hundred times faster than IBM's board.

Both the IBM and the Plantronics board allow programming in Microsoft BASIC using the graphics commands and statements (PAINT, DRAW, LINE, PUT, GET, BLOAD, BSAVE, CIRCLE, PSET, POINT). However the Plantronics board will not work with the PAINT statement since the method Plantronics uses to preserve IBM compatibility is to switch back and forth between two color planes. To BASIC, each of these planes looks exactly like an IBM board. These "multiple video planes" allow four colors to be overlaid in various combinations to form 16.


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### Goodbye Old Paint

Microsoft BASIC has no provision for dealing with 16 simultaneous colors, end its PAINT statement has no way of knowing thet bits from both color plenes must be checked to fill in an outline. This forces Plantronics board users to writa their own fill routine or simply not use PAINT. Also, with the Plantronics board, you must repeat each of the Microsoft BASIC graphics instructions twice, once for each plane. Microsoft will eventually have to adapt MS-BASIC to handle 16 colors in a graphics mode, but this mey not happen until IBM releeses its own board.

It will be difficult initially for menufacturers to find software that can handle existing—end relatively primitive—graphics operations, while allowing the enhanced imaging capabilities of the new hardware. The first manufacturer to offer a weelth of software-accessible features and wired-in graphics utilitias, while providing an easy interface to higher-level lenguages, may just pull away from the competition.

Industry axperts agree that this coming generation of higher-quality graphics boards, elong with improved monitors needed to display the results, will launch a new role for the IBM PC as a sophisticated graphics workstation. A year or two down the road, PC users will probably be able to turn out fairly spectecular imagery for point-of-sale displays, videotext screens, computer-based product information programs, how-to-do-it interactiva videodisc/computer packages—perhaps even magazine grephics, typesetting, end commerciel-quality animation.

### Saw Blade Magic

One of the first graphics utility packages for a new genaration board is *Videogram*, the initial product of a small New York software house callad Softel. *Videogram* is a 16-color "graphics presentation software package" that works with the Plentronics board and sells for $300. (Softel also sells both the $475 Plantronics board plus *Videogram* peckage, for $525.) *Videogram* offers such advanced features as paintbrush creation end storege, 6X zooming for fine painting, image moving and copying, and data interchangeability with programs written in BASIC.

Softel president Paul Fiondella previously worked for NYIT, one of the netion's foremost computer-animetion centers,

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where ha was exposed to the work of such computer graphics pioneers as Alvy Ray Smith. Fiondella's goal was to produca a program that would transport many of the NYIT procedures lo the IBM PC, and do as much of the "front end" drudge work for the PC user as possible.

Fiondalla admits there is an illusion that the biggar the system tha better the result—at NYIT he used a powerful VAX mini-computar—but ha strongly denies this: "I've worked with artists who used nothing more than a sharpened saw blade and black film leader to create the most incredible graphics. It's more a question of easa of operation, the number of obstaclas the computar placas or doesn't place in the way of your ability to use the equipmant." What most impressed him at NYIT was the possibility that some of the best features of their VAX system could be moved to a smaller machine. But, according to Fiondella, such larga professional studios as NYIT have no interest in making computer graphics more available to the public.

Fiondalla was also a member of tha Filmmakers Cooperative in New York in the 1960s, where he worked with Kan Knowleton, a Bell Labs scientist who had developed an advanced graphics language callad BaFlix. Fiondella feels thare is a visible thread from Knowleton's work, through various paint programs, to Videogram, in the way thay all handle textures adroitly. He points to his brushes—the actual devicas with which usars paint or draw their onscreen images—as a good example of an advanced feature that has successfully made tha jump from a larga system to a small ona.

### A Watchmaker's Hands

Videogrom is written in BASIC, and produces images that can be handled by BLOAD and BSAVE commands. The idea, according to Fiondella, was to "give BASIC programmers a powerful graphics utility for their own programs, and at tha same time give businessmen a convenient way to make sophisticatad charts and images without requiring ony programming." He claims it shouldn't be necessary to write programs in assembler: "for many purposes Microsoft BASIC is plenty fast, and largely transportable to othar computers."

However, he would prefer other graphics languages if they made better use of tha

PC's resources. "BASIC is not really a very intelligent language, and it has a 64K memory barrier. And there are things about BASIC that are very difficult to deal with in large programs, such as the lack of local variables. A language such as C has many more facilities for writing more complicated programs."

Fiondella is proudest of the way his program will allow users to fine-paint small parts of the image pixel-by-pixel, and of his visual command system. Users often want to go back and touch up or erase parts of images they've created. The fine-paint command magnifies sections of the screen and blows up the size of the pixels so they can be isolated and their colors manipulated. Without it, users would need the hands of a watchmaker to change the image dot-by-dot.

His visual command system substitutes small pictorial representations of graphics commands for the commands themselves. Each of the PC function keys, plus the Tab and Escape keys, controls one command. Hit one of these keys and the appropriate graphics command icon appears onscreen. If you want to work with it, you simply press the Enter key. Otherwise you hit another command key to select an alternate operation.

Fiondella suggests that prospective microcomputer purchasers who need top-quality graphics "compare Videogram to the Apple graphics system, where you practically have to type in your address to get something to happen. God forbid you type in an Apple command incorrectly. With Videogram you can't type in something wrong because you never have to type in anything; instead every action is a one-key command."

You can create your own brushes or use the ones that come with the package. A brush is an arrangement of dots of the same color in a user-determined pattern within an 8 by 8 dot grid. With it, you can paint using any of 16 colors, something you can't do with any other program, according to Fiondella. The brush can be used in four different sizes and a vast selection of textures. And, the program makes it easy to save a previously-designed image, such as a company logo, and "paste" it onto a graphics screen.

While his program works only on the Plantronics board at present, he plans to make his program compatible with most of the new graphics boards. A version of


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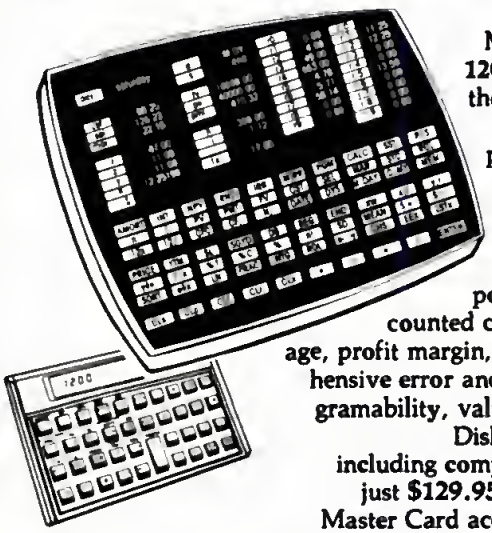
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Videogram is already being written to run on the Olivetti M-21, which has a resolution of 512 by 256. Fiondella expects to sell his program primarily to companies that will use it as a grephics utility in their offices. He also sees schools as a major market. But the future of grephics software, he feels, is in bundling it into integrated software packages along with databases, spreadsheets, and word processors.

*USERS WILL need stored "vocabularies" of lines, textures and shapes.*

"Graphics will play an essential part in the future of microcomputers," he esserts. "It will become very important in teletext oparations and will be usad to genarate high-quality slides, to replace carousel and overhead projectors. Some users of the program will turn their PCs into video character generators. If a company can create just one good image that it can use in its edvertising end merketing, the system will have paid for itself many times over. And once other companies see what pioneering users of such systems are doing, it won't take much persuading to get them to make this kind of software purchase."

### Zooming and Stroking

Videogram does make it easy to color individuel pixels by zooming in on small sections of the screen. It uses the PC function keys adroitly, and saves much keystroking. And its ability to retrieve small saved images and insert them wherever wanted lets it process images the way text editors process words. Finally, its icons—the pictorial elements thet represent grephics actions—are excellent. In any case there isn't much else on the market, besides Videogram, that can work with the new high-powered boards.

Since this program relies on BASIC's repertoire of graphics commands and statements, the production of images is not as fast as it could be. Even though the single-key commands dramatically reduce the amount of time it takes to put images such as circles or squares onto the screen, complex pictures can still require leborious hours of peinstaking detail work. This is because graphics are difficult to create from a keyboard. Artists don't type paintings—they use brushes, pens, end styli. The electronic equivalents of these painters' tools are digitizers like touch screens, bit pads, joysticks, trackballs, light pens, and mice. Fiondella is currently trying to add a mouse interface to his system, which should help make graphics creation far less irksome.

### From Toy to Tool

IBM's original PC graphics system was a toy. But the high-performance boards and monitors just now hitting the market, combined with newly available digitizing equipment, will turn a PC into e sophisticated graphics workstation that would have sold for $100,000 or more several years back. There are even half a dozen expensive ($2,500 and up) new cameras on the market that can make professionel photographs of these enhanced images, as well as several interfaces thet can produce animations on videotape.

What is needed now is software that will make it easy for users to create, manipulate, and store such images, than display them without excess grief. Videogram is a step in the right direction, but graphics software in general has a long way to go. Faster and more powerful image-producing and editing commands need to be written in low-level languages and attached to single-key English instructions. Users will need stored "vocabularies" of lines, textures and shapes that can be put on the screen by pointing to an area, specifying its size limits, and pushing a button. And systems will have to be packaged with friendly, menu-driven front ends that will let you doodle with a digitizer.

The state of microcomputer graphics is changing rapidly. Apple's Lisa already has some of the features mentioned above, though on a monochrome screen. The exotic electronics and special software languages of larger, dedicated graphics machines are hurriedly being translated for the PC. Will you be able to have such a sophisticated graphics workstation at your fingertips before next year? You can bet your bottom dollar the answer is yes. But until then, it just may cost your bottom dollar to buy one. */PC*

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How many programs can make news just by issuing a revision? Somehow I don't think you'll ever see the new *EotsMon version 2.2* (now with user-selectable power-pill color!) or *Dentol Records 3.96M* (silver fillings may now be distinguished from gold!) getting much ink.

But *WordStar* is indubitably and deservedly a classic. It's been a huge success on 8-bit computers, and MicroPro says it's sold 50,000 copies for the IBM PC alone. So when not one, but two updates come along, that's news.

Or is it? WordStor users mey be pardoned a certain sense of dejo vu. Before we tackle WordStor 3.24 (now yesterday's news) and the jazzy new version 3.3 (with speedy memory-mapped video, user-definable function keys, all-new manuals and installation procedures, and an update policy designed to give current users apoplexy), perhaps a little historical background is in order.

### Top of the Keys, Ma!

Hard as it may be for newcomers to believe, there was a time in the dim, distant past (about 365 long days ago) when the only word processing programs aveilable for the PC were EosyWriter 1.0, the original version of Volkswriter, and what-

***MANY PC owners bought Baby Blue cards mainly to run a CP/M version of WordStar.***

ever your friend down the block had slepped together from BASIC. The fect that many PC owners bought Baby Blue cards mainly to run e CP/M version of WordStor speaks volumes about the program's popularity and power.

Then came WordStor for IBM. It was called version 3.02M, and with hardly any competition on the market, the disks moved off the sbelves faster than Charlie Chaplin's pies.

Its manuai was a looseieaf nightmare and the tutorial thoughtfully let you enter page upon page of sampla taxt instead of providing even ona example on disk. Tbe IBM function keys seemed to have been assigned lete one drunken Saturday night. The program supported only the IBM Parallel Printer, which couldn't do subscripting or suparscripting. Block moves were severely limited on the 64K machines most of us used while waiting for the expansion-card situation to improve. But, wa loved it.

Those of us wbo dutifully sent in our registration cards got a letter from MicroPro congratulating us on our sagacity. We also got a bunch of "keytop" stickers for our keyboards in case we weren't quite sagacious enough to memorize all of WordStar's one-key Ctrl commands.

Now and then some of us tried to get belp—interfacing a nonstandard printer,

***IN THE immortal words of MicroPro: "Ask your dealer."***

reporting e bug, or whatever—by writing to MicroPro or calling at our own expense. This was rarely a pleasant experience. MicroPro held to its principles, number one of wbich seemed to be, "We will give the user absolutely no support." This philosopby was usually expressed by e simple three-word phrase: "Ask your dealer." Alas, few IBM dealers back then had any more experience with this *WordStar* than the users. It was around this time that one began to hear users mutter the most common of the non-obscene epithets used to describe MicroPro: "arrogant."

### Lots of Calls

PC-DOS 1.1 came out a few weeks later. *WordStar* 3.02 did not run from PC-DOS 1.1, MicroPro blamed this on Microsoft for changing some of its operating system's specs without advance warning. Whoever or whatever was to blame, the fact remained that those with double-sided drives had to limp along half-bakedly in PC-DOS 1.0 for months while MicroPro delved deep into the mysteries of the new disk operating system.

MicroPro undoubtedly referred a lot of callers to their dealers during this period. But when it released its PC-DOS 1.1-compatible *WordStar* 3.20, did MicroPro use its address lists to send us news of the update as quickly as it got us our keytops?

Nope. MicroPro also left that job to its dealers, few of wbom had bothered to keep datsbases full of information on just wbo had bought just which version of *WordStar*. News of 3.20's existence filtered out to the world like gossip about certain film stars' arcane pharmaceutical habits—the difference being that *WordStar* never made the tabloids. After stumbling upon the news in a magazine, club newsletter, or bulletin board, disgruntled citizens across America muttered impre-


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cations, paid handling charges, returned their original 3.02 WordStor and MoilMerge disks to their harried dealers, and waited an estimated "4 to 6 weeks" for version 3.20 to return.

### Larvae and Pupae

Version 3.20 retained some old bugs and offered some new ones of its own. Using WordStor's run command (R) while its menus were suppressed often creeted a dump of memory onto the screen—a graphics fireworks display thet occasionally hung the system. Tbe hyphenation feature sometimes left a useless message on the screen long after it bad served its purpose. And if you accidentally inserted an illegal character (such as a /) in a filename, you got a "Disk Full" error that could do nasty things to your current file and bomb you back to PC-DOS. Love began to go sour.

The 3.20's installation program offered a new menu of printers, but only daisywheelers were added. They had to run serially, too; the IBM remained the only parallel printer with support. And SpellStor 1.20 crashed whenever it ran into certain words beginning with re.

But still, with the puzzling new documentation you could alweys patch the printer area for your machine, es long as you knew enough about DEBUG, hex characters, and control codes. "Disk Full" errors were definitely less of a problem for those using 320K drives. And the best yet: when you sent the WordStor 3.20 registration card back in the mail, you got another letter congratuleting you on your wisdom—and enother set of keytops! If you also happened to be a MoilMerge registered user, you received two letters and two sets.

Users all over America stuck keytops to their foreheads in silent protest. A few intrepid souls may even bave tried to get through to MicroPro to ask about how to run WordStar with their new "fully IBM-compatible" NEC Spinwriter 3550s. It was around this time that a collective mutter of "arrogant" was heard rumbling throughout the land.

### One More Time

A couple of months later, new rumors floated through the computer world as MicroPro ignored its registered users yet again. This time there was supposed to be a WordStor 3.24 that would fix "all known bugs." As usual, you would need upgrades of Moilmerge and SpellStor to run with it. As usual, the upgrade was nominally "free," but many dealers (unless they were very understanding) exacted some sort of handling charge. As usual, you needed to send in your 3.20 disk and wait 4 to 6 weeks for the upgrede. And you would do all these things gladly, because of the clever inducament MicroPro had provided in the past: keytops!

Alas, I've never gotten my keytops for duly sending the registration cards in for 3.24. Maybe something wes wrong with the mails. But I did get my new disks.

### 3.24—Standard of the Month

Version 3.24 will run from PC-DOS 1.1 or 2.0. It catcbes illegal filename characters. MicroPro supposedly has rectified the problem in SpellStor 1.24 (untested by me). The R (run) screen dump bug has also been fixed, though a message (visible only when the menus are not suppressed) warns that some programs may not let you back into WordStar when you're through with them—DISKCOPY being but one of many. The message implies that this problem won't happen with PC-DOS 2.0, but MicroPro now admits that another last minute DOS-surprise from Microsoft has rendered that implication untrue.

*SPELLSTAR 1.20 crashed whenever it ran into certain words beginning with re.*

The new version's documentation includes a tantalizing sheaf of material ebout the non-IBM MS-DOS and CP/M-86 versions. Users with those editions apparently get a mucb better installation program. It lets them change the starting defaults for such things as margination, justification, hyphenation, and pagination—a whole damn nation of ill-chosen defaults that most of us PC users have to change every time we type those magic letters WS from PC-DOS.


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To run properly with WordStor 3.2 or 3.24 under PC-DOS 2.0, SpellStor 1.24 must be modified with the overlay file SPELSTAR.OVR. A corresponding patch must also be made to one WordStar file: WSOVLY1.OVR. This patch to WSOVLY1.OVR must also be made to WordStor versions 3.20 or 3.24 when running with SpellStor 3.3. The combination of SpellStar 3.3 and WordStar 3.3 already has the correct patches built in.

Use DEBUG to make the following changes (all numbers are in hexadecimal format).

WSOVLY1.OVR

| Address | Old Contents | New Contents |
|---|---|---|
| 3707 | 2e | 1e |
| 3714 | 90 | 30 |
| 3715 | 90 | e4 |

SPELSTAR.OVR

| Address | Old Contents | New Contents |
|---|---|---|
| 100 | 58 | e9 |
| 101 | a2 | 9d |
| 102 | d6 | 00 |
| 103 | 02 | 90 |
| 1a0 | 20 | 8f |
| 1a1 | 20 | 06 |
| 1a2 | 20 | b0 |
| 1a3 | 20 | 01 |
| 1a4 | 20 | 8f |
| 1a5 | 20 | 06 |
| 1a6 | 20 | b2 |
| 1a7 | 20 | 01 |
| 1a8 | 20 | 58 |
| 1a9 | 20 | a2 |
| 1aa | 20 | d6 |
| 1ab | 20 | 02 |
| 1ac | 20 | e9 |
| 1ad | 20 | 55 |
| 1ae | 20 | ff |
| 6a7 | 8b | ff |
| 6a8 | e3 | 36 |
| 6a9 | b1 | b2 |
| 6aa | 00 | 01 |
| 6ab | b2 | ff |
| 6ac | 00 | 36 |
| 6ad | e8 | b0 |
| 6ae | 7e | 01 |
| 6af | 36 | cb |

*Figure 1: Patches to run WordStar and SpellStar under PC-DOS 2.0.*

PCers still get second-class treatment with a new version of the old installation program that deals only with printers. It adds precisely one printer to the limited menu: the NEC Spinwriter 3550. Many models of that printer require new PROMs to be installed before they'll work properly with WordStor. NEC will make the change for free, but there's no mention of this arrangement in the WordStor documentation. In the immortal words of MicroPro: "Ask your dealer."

Finally, there's a problem with the 1.24 version of SpellStor when it's run from PC-DOS 2.0. MicroPro has provided a fix, though. For details, see Figure 1.

## Modern Times, the Coming of 3.3

No sooner was 3.24 in the hands of harried users than rumors of a new WordStor flashed through the world. MicroPro briefly denied it, but the truth is out. Version 3.3 is with us at last—or should be by the time you read this.

What's new about 3.3? Quite a bit and not much. Screen handling has been greatly improved by using memory-mapping. The ten function keys are now programmable by the user. A new installation program lets you change quite a few of the WordStor defaults and handle a wide range of printers. Finally, and most important for new users, the manuals have been improved by orders of magnitude.

The new version will run on a 64K system from PC-DOS 1.1; with PC-DOS 2.0, which takes up more space, it will require more. Still more memory—the number appears to be 64K on top of whatever the operating system requires—is needed to take full advantage of all the new features, such as simultaneous printing and editing. The CP/M-86 version of 3.3, which I did not test, requires 80K.

## The WordStar Time Trials

Memory-mapping of screens is the most noticeable new feature. This technique, seen on PeochText and other late-model word processors, makes screen rewriting significantly faster. How much faster? I used a stopwatch to find out.

After you hit the PgUp or PgDn keys, the old version would make you wait about 2.5 seconds for the screen to rewrite. Version 3.3 reduces that time to about half a second—a fivefold speed increase.

Some functions register even more impressive gains. Scrolling one line downward in the old version meant a wait of more than 2 seconds for a fully rewritten screen. In the new version, the same command worked so fast my stopwatch finger was really too slow to catch it; the result of 0.2 seconds probably reflected my rotten reaction time. Unlike the old version, 3.3 can keep up with continuous scrolling commands in either direction.

***MICROPRO seems to have tamed the cursor.***

The difference can really add up in commands that do a lot of work onscreen. Using the "Ctrl-QQ Ctrl-B" paragraph reforming command to change the margins and line spacing of a 32,000-character test document took a little over 6 minutes with the old version—and about half that time with the new.

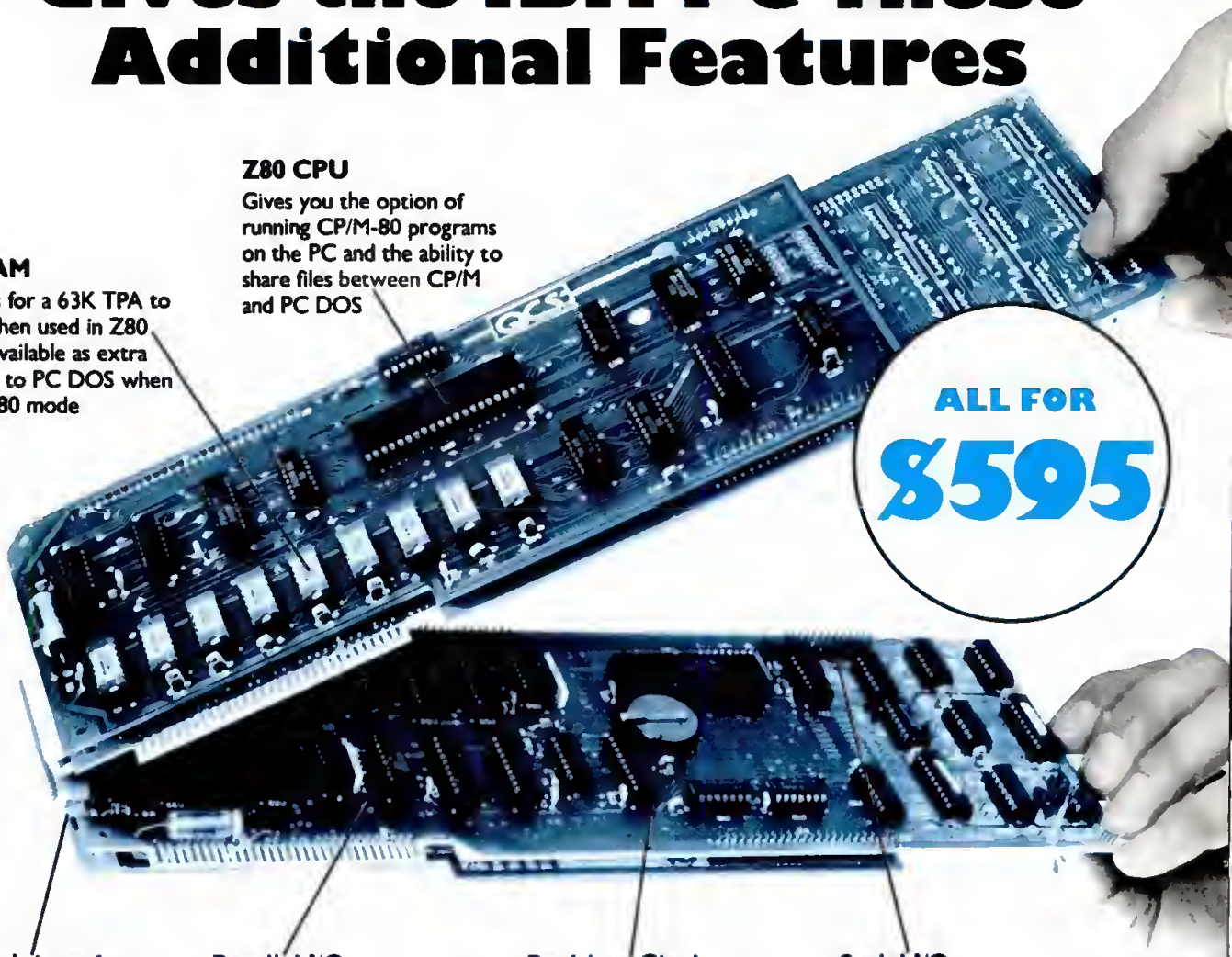
An extensive backward search-and-replace in a 16,000-character document took nearly 2 minutes in the old version and about 1 minute in the new. But the speed difference between the two versions could be minimized by hitting one of the arrow keys after ordering the search and replace; that prevents screen rewrites during the process. This technique sliced the old version's running time to just six seconds; the new version beat that time by only one second—the only difference being the time it took to rewrite the screen at the very end. My conclusion (supported by MicroPro): the internal operations of WordStor have not changed at all.

It's a slightly different aesthetic. Old WordStor seemed to "paint" the screen. Version 3.3 seems to "jump" into action. It can be slightly disconcerting, especially when you insert text above a page break indicator, which sometimes seems to bounce on the screen. I can accept this new quirk: after using the version 3.3 for a week or so, I find waiting around for the lethargic old version's screen rewrites as tedious as watching fleas grow hair.

Another nice thing about WordStor 3.3 is that MicroPro seems to have tamed the cursor. In earlier versions, the cursor often jumped ahead to the end of a word or line and back to the proper position when you

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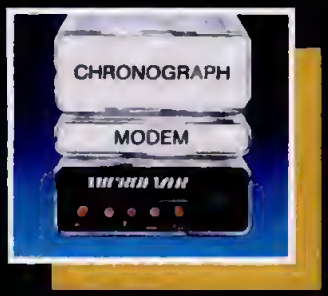
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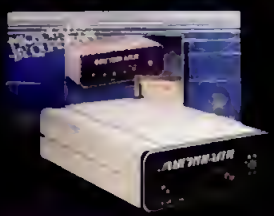
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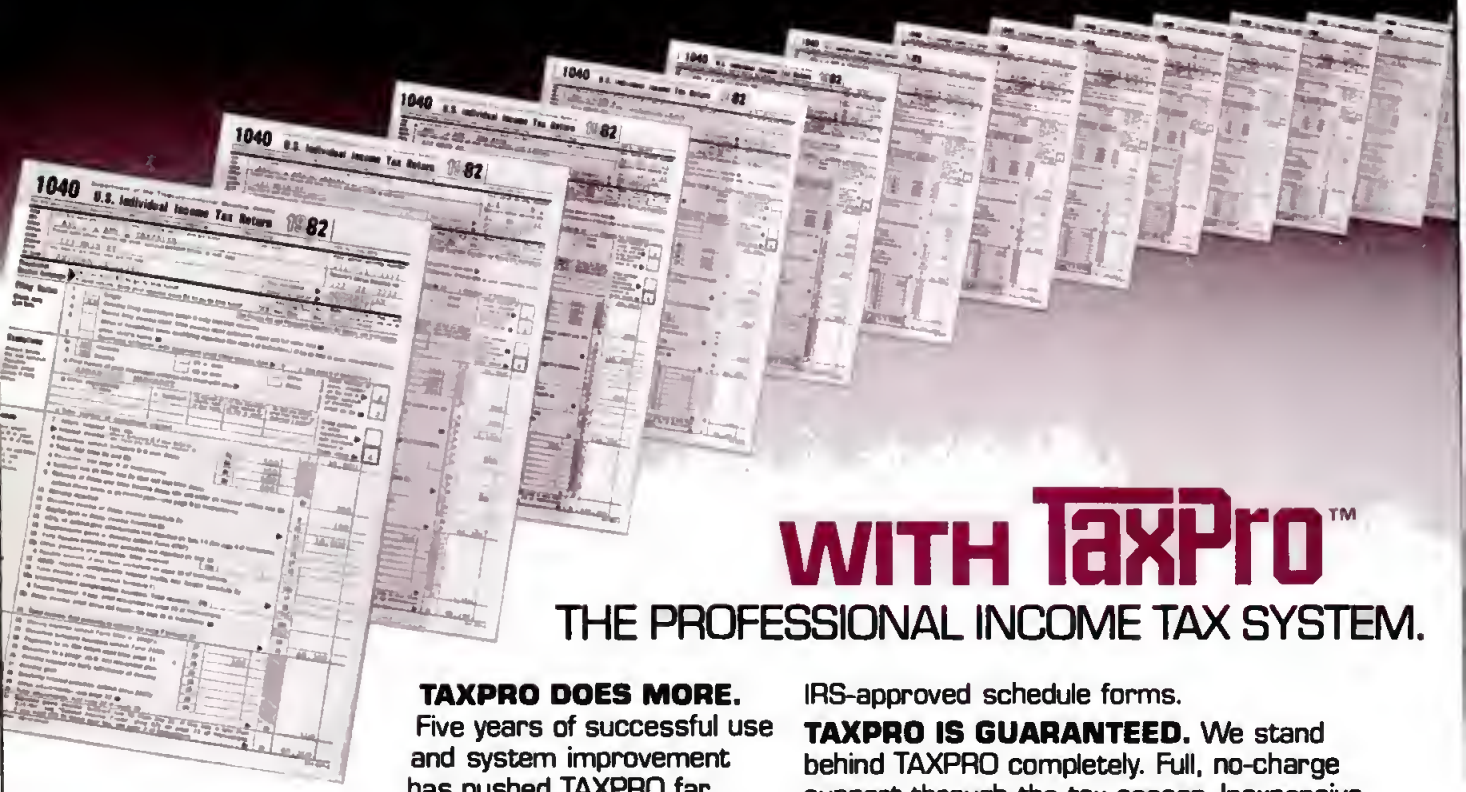



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inserted text. It doesn't do that anymore.

### Plus Ça Change . . .

But virtually nothing alse has changed about WordStor. No internal oparations heve been revised, so in many respects version 3.3 is still not destined to be a speed demon. Much of the WordStor program is not residant in main memory. It's on overlay filas that stay on disk, where they're called up as needed. Since these files are needed quita oftan, this system can slow things down significantly. By putting those ovarlays on e disk emulator in RAM, disk eccesses become significantly faster, and unnoticeabla visually or eurally. If I hadn't been able to do that, I'd probably have switchad from WordStor long ago.

Another problem with WordStor is thet it never addresses more than 64K of RAM—grand total, program and data—no matter how much memory you have in your mechine. In prectice, this meens thet no more than about ten pages of your documant can be in RAM at ona time. Larger documents ere hendled by swepping portions back and forth from disk.

This slows things down, too. With WordStor, files ere loaded into memory e hunk at a time until tha workspace is full.

A Initial help level
B Decimal point character
C Non-document mode
D Initial directory display
E Initial insertion toggle
F Justification toggle
G Hyphen help toggle
H Omit-page-numbering toggle
I Top page margin
J Bottom page margin
K Left margin
L Right margin
M Number of lines per page
N Page offset
O Form feeds
P Data field separator
Q Variable name symbol
R System disk drive
S Function keys

*Figure 2: Lettercodes for modifioble WordStor defoults.*

As you move forward through en existing document, hitting PgDn can produce a short deley while WordStor goes out to gat the naxt hunk. Once the file is fully loaded into memory, moving from pega to pega or aven from front to back takes about a second. But if the document is too big to fit in the RAM, the same commend can take ten seconds or more. And because WordStor creates special files for backward moves in long documents, such moves take even longer. Given all the memory available in meny user's PCs, this is a shame.

MicroPro tells me ninety-odd percent of all documents craeted with WordStor are three pages or shorter, which is its excuse for not expending available memory. Still, since WordStor is one of the most trensparent editors aveilable for handling long documents (in fact, there is no official maximum documant siza) this strikas me as a copout for wasting potential. By adding evan 64K to the workspece, MicroPro could solve the problem for all but the very longest chunks of text. But, this hasn't happened.

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a few more. The good part is that you can change a wida ranga of defaults to suit your needs (see Figure 2). Now you can dash off a quick latter without having to remember to type an .op command to avoid getting a naatly centared paga number—that's enough to make the long suffering WordStor user's ayas fill with tears of joy. Being able to bring up the progrem with automatic justification end hyphenation turned off truly maketh tha cup run over. But changes to the dafault values for such things as top margin, bottom margin, and page offsat are not reflected in the online Help screens available from the J menu. Better write your new defeults down to avoid latar puzzlamant.

### Funk and Function

MicroPro has a philosophy about function keys. The company contends that control characters are easier to use because you don't have to mova your fingers from the keyboard's home position.

Now I don't entirely disagree. When entering text, I find myself using tha control key versions of the simplar commands more often than not. Though MicroPro has tekan a lot of guff for making tham nonmnemonic, I like them that way. All the basic cursor-movamant commands are positioned on the keyboard to be reached by the left hand. Once you're used to them, your muscular memory will guide you to the correct keys. The method of moving the fingers laft or right to move the cursor correspondingly may not provide you with mnemonic initials (A for Left, F for Right?), but it's logical and fast.

*WITH ONLY TEN keys to play with, you're going to assign them to functions you'll use frequently.*

When you're editing text, function keys maka a lot more sense. You're often doing fancy footwork with block moves and tha lika, and you want those editing commands ready to go at e single touch. Evar sinca the first IBM version of WordStor, MicroPro hes implemented the PC's ten function keys—but only in their unshifted modes. In version 3.3, they've retainad the same functions as before—except for relocating tha "go to beginning" and "end of file" commands. Contrary to ell sensa, the beginning of file command had been on F10, and the and-of-file command on F9. In the new version, sensibly, they're swappad.

In case you prefer the old way, you can switch back. The new installation program lets you decide whet the ten unshifted function keys will do. Each key may be assigned a maximum of six charecters.

### Liberating Line 25!

You can also put a custom six-character-dascription of eech function key you set up on the bottom line of the screen; this will appear in a format similar to the one IBM's BASiC uses. As far es I'm concarned, that's an utter wasta of precious


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screen space. Since the PC's function keys don't run beneath the screen across the top of the keyboard, their position isn't consistent with the labels on the screen. Besides, with only ten keys to play with, you're going to assign them to functions you'll use frequently. The minute you memorize them, you're going to want to turn off the damned labels that keep staring back at you just two lines below where you're usually entering your text, stealing a precious line of your screen.

But you can't shut them off! Considering that WordStor has toggles for everything else but the status line—you can take off page breaks, control characters, the ruler line—this is a real stupidity. Fortunately, I've prevailed upon MicroPro to let us in on the secret of freeing line 25 from the labels. See Figure 3 for details.

### Apple Polishing

MicroPro's philosophy—or something—keeps it from doing anything sensibla about the PC's 30 shifted function keys or the control-shifted versions of its numeric keypad. Other programs (including my ProKey-enhanced version of WordStor) logically make Ctrl-left-arrow and Ctrl-right-arrow move the cursor left or right a word at a time. But not WordStor. This is all the more annoying when you consider that MicroPro has implemented that sort of arrangement on versions for the Apple IIe and III. It even assigned 20 additional functions to the "Open Apple" and "Closed Apple" keys used in conjunction with the ten numerals. Didn't IBM users deserva as much?

1. Make a spare copy of your disk with tha WS.COM file (just in case).
2. Place a PC-DOS disk with the DEBUG.COM file in drive A.
3. Place the disk with the WS.COM file in drive B.
4. At the A> prompt, type and enter debug b:ws.com.
5. A hyphen will be displayed. That's the DEBUG prompt. Type and enter e 0248.
6. Be sure "18" is displayed. Then Type and enter 19.
7. Type and enter e 5041.
8. Be sure "8d" is displayed. Type and enter c3.
9. Type and entar w.
10. You will get a message about the material being written to disk. At the hyphen prompt, type and enter q to exit to PC-DOS.
11. The patch has been made. If at any point abova, you fail to see what has been specified, do not attempt to make the patch by typing w. Instead, at the hyphen prompt, simply type q. This will allow you to exit to PC-DOS without saving your changes to disk.

*Figure 3: Instructions for moking a potch to get rid of the function key display in WordStar 3.3.*

Aside from the function keys, no key assignments are aasily changeable from MicroPro's choice of defaults. The deletion key still behavas like a destructive backspace, dalating the character to tha left of the cursor instead of the one above it. Considering that Ctrl-Backspace does tha same thing in tha sama way, this has always been nonsensically redundant. We've got a fix for it in Figure 4.

But let's face it: WordStor 3.3 is not going to take many sales away from the inventors of ProKey and similar keyboard enhancars. WordStor's ten function keys just aren't enough to go around, and each key's six-character limit maans you can barely use one to set a margin. Serious WordStor users and authors with special formetting needs (screenwriters come immediately to mind) will find that a keyboard enhancer is an absoluta must to keep WordStor from producing nothing but frustration.

### Install or Stall?

Micropro claims its new install program is user-friendly, but the manufacturar has a definition of friendliness that's different from mine. To use its program to reassign the function keys and onscreen labels, you have to loop through forty prompts and responses. Apparently memory-mapping wasn't used in the installation program: some of the repeating prompt screens take as long as twenty seconds to write. In addition, some of the instructions are less than clear. Fortunately, you won't have to use the program often—you wouldn't want to.

You also use this program to install WordStor for the type of printer you have.


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This is eesy enough if your printer is one of the ones the program supports. (These are listed in Figure 5.) If not—end some prominent modeis are omitted—you bave to go through a long session of setting control codes. This task must be done in bexedecimel formet. Unless you are reasonably expert, you may reasonably expect to become confused.

Tbe instelletion menual, unfortunately, only adds to the confusion. It offers page upon page of incomprehensible material on protocols and printer drivers without ever mentioning that none of that information is the least bit relevant to installing printers that run from e parellel port. Although its documentation doesn't mention this, MicroPro recommended that a printer running from the IBM be configured with no protocol and treated as an "operating system primary list device." If this is done for a serial printer, two PC-DOS commands will be required:

```
MODE COM1: 9600,N,8,1,P
MODE LPT1: =COM1
```

These commands assume that the printer will be running at 9600 baud end thet a cable lets the printer end the PC exchange status information.

1. Follow steps 1 through 4 in Figure 3.
2. A hyphen will be displayed. Thet's the DEBUG prompt. Type end enter e 71C.
3. Be sure "7F" is displeyed. Tben type and enter 07.
4. Follow steps 9 through 11 in Figure 3.

*Figure 4: Instructians for making a patch to make the Del key delete the character above the cursor. This method works with WordStar 3.20, 3.24 or 3.3.*

If you're an old WordStar bend, you'll probably find it speedier to use DEBUG to make ell your patches at once rather then endure a seemingly endless and occasionally ambiguous series of prompts. All the petch points documented in Appendix C of the WordStor 3.20 and 3.24 manuals remain the seme in version 3.3. A new patcb area is included for the NEC 3550's "VMI Trailer String"; it begins at 0881b, so eddresses above thet will not match the old version.

Specific documentetion on those points will no longer be supplied to users of WordStar 3.3. MicroPro has decided to limit access to those documents to distributors and dealers. If you're contemplating an upgrade, seve your old menuals. Although the new installation program can be used to petch meny arees, some (like the underscore character, needed by the Okideta 92 end other printers) ere eccessible only through DEBUG.

A special installation program for PC's operating in color was not available at press time. This program will allow a user to try out various combinations of foreground end background colors—one for text, and one for menus end highlighting—before selecting the most suitable

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one. Once again, this program makes no changes in previously available features; it simply makes some already existing features more accessible to users without technical expertise.

A few minor changes have been made in the program itself. The traditional WordStor menus have been cleaned up a little. The Opening Menu is now called by that name rather than "No-File Menu." When working with it, you now get the message "not editing" on the status line instead of "editing nofile."

The layout of toggles has changed, too. The oxymoronic message "justification on (OFF)" is now simply "justification now OFF." Heretofore, the menu has falsely claimed that typing Ctrl-Q-Del would delete the line to the left of the cursor; now it really does. (Typing Ctrl-Q-Ctrl-Backspace always has accomplished the same thing and it still does.) All of these clarifications should make things less confusing for new users.

### Manual Dexterity

New users should also fare significantly better with MicroPro's entirely rewritten manuals. Presented in slightly-bigger than IBM-size ring binders and typeset with excellent graphics, they are the best thing in the new package.

The WordStor manual is one of the best I've seen. Organized by menus and functions, it's clear, readable, and informative. To eliminate possible points of confusion, it offers simple, pithy examples and illustrations. It also provides a wealth of handy tips that many seasoned users had gone months before discovering. I even learned a few things myself.

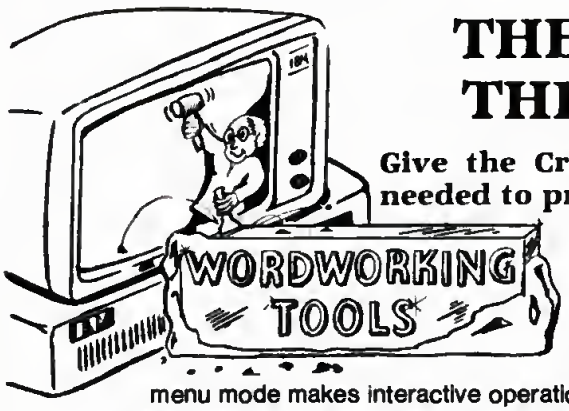
About all I missed from the old manual were the classic essay on "Where the Cursor Won't Go," explanations of certain useful technical items (the current manual seems to take great pains to avoid these points), and the more detailed explanation and hortatory material about the necessity of saving text to disk.

The *MailMerge* manual is vastly improved, too. The old one was a marvel of incomprehensibility. The new one, with its copious examples and clean graphics, helps make a complicated process under-

These printers may be installed in either serial or parallel mode if applicable. Other printers may be installed with a "custom printer installation" option.

A C. Itoh/TEC Starwriter F-10
B Centronics 353
C Centronics 739
D Diablo 630
E Diablo/Xerox 1610/1620
F Diablo/Xerox 1640/1650
G Epson MX80/100-no Graftrax
H Half line feed printer
I IBM Parallel Printer
J MPI 88G/99G
K NEC 8023A Matrix Printer
L NEC Spinwriter 3550
M NEC Spinwriter specialty
N Okidata ML84A
O Olympia ESW-102
P Qume Sprint 5-9/45-11+
Q TI 810/820
R Backspacing standard
S Standard printer

*Figure 5: Letter codes for standard printer types supported by the* WordStar *installotion program.*


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standeble. There are, however, some omissions: the explanation of how to use a commend file to link multiple files (for example, chapters of a novel) et print-time was more comprehensive in the old manual. Neither is informative enough about all the useful things that can be done with the best-kept secret in the WordStor world: MoilMerge's powerful "print-time line former." This lets you change such tbings as margination and line specing at print time without making eny changes in your document.

The new menuels ere ruthlessly honest. They even point out some of WordStor's limitations—like the find command's frustrating inebility to catcb multiple-word strings when they break across lines—and give suggestions about what to do about them. (In this example, not much can be done, I'm efraid.) The manuals are so honest, in fact, that they point out problems thet don't exist. According to the manual, trying to change the logged disk drive to one that doesn't exist will force you to reboot the system. When I tried it, the worst that heppened was thet WordStor just ignored the commend. Certain warnings about file length don't seem terribly relevant to the IBM world.

This points up the biggest problem with the documentation. The only information specifically for the IBM PC eppears in a section ingenuously nemed "Addendum of Speciel Considerations: WordSter for IBM PC, Apple, and Other 16-bit Computers." (In case you're wondering, it doesn't really apply to the Lisa.)

***THE MANUALS are so honest, in fact, that they point out problems that don't exist.***

Tbis is the only place users can read that the PC's arrow keys do work and that the function keys may be designated by the user. This section could well be overlooked.

The folks at MicroPro still don't understand points about the PC. They seem to believe that the numeric keypad will function as a cursor ped when the NUM LOCK shift is ON: The rest of the world does not agree.

MicroPro bas chosen, unfortunately, to retain its truly ewful *WordStar Training Guide*. In the palmy days of 8-bit CP/M, when nothing else was around, some people called this now-ancient document stete-of-the-art. Today it can only be termed dismal.

The training guide forces you to type long documents—and type them with errors intact! This goes contrary to hebit; the required errors in the text aren't even highlighted in any way. If you manege to repress your instinct for rectitude, you'll get to cleaning up your text leter on. But if you've typed the "errors" erroneously, you'll run into problems.

If the sample texts were offered on disk (as with just about every other program these days) and the lessons were more carefully thought out, the *WordStor Training Guide* might be worthwhile. I remember trying to learn *WordStar* from it in my novice days and giving up in disgust. My solution was to read through the manual and key in summaries of its various sections. That method or studying one of the many non-MicroPro *WordStor* books, cassettes, or disks still seems better than confronting the treining guide. Its CP/M-oriented treatment of machine-specific items can cause messive confusion.

## Room for Improvement

*WordStor* 3.3 is e definite improvement, but it does retain some old frustrations. It's now almost impossible to outtype the screen, but you still have to reform paragraphs yourself if you don't want to find text banging around in bad places. Using Ctrl-B to reform longish paragraphs still tends to stick the cursor at the center of the screen, forcing you to scroll upward to see your starting point.

Despite the added speed, lots of things are still slow. Saving long documents can seem to take forever (to be precise, 20 to 40 or more seconds). The length of your weit depends on where the cursor is et the time of the save: the closer it is to the end, the faster.


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It's still annoying to work in the "outer spaca" area reeched by horizontel scrolling. Even with memory-mapping, after correcting e line of text sticking out to the right, you might have an annoying wait before the rest of the text comes back again; sometimes you only get halfway back to where you went to be. Holding down a left or right arrow key when the cursor is out past column 80 can give bizarre results. Tha cursor saams to bump against the edge of the screen when it's actually moved a long wey: how fer is revealed only when you lift your finger from the key.

The most irritating glitch occurs when you're paging through long filas. Somatimes when you hit the PgDn key, WordStar skips e few pages—jumping, for example, from paga 5 to paga 12. This seems to happen only rarely, and no text is actually lost, but it's terribly unsettling. The problem has been around since version 3.02; while I was aditing this article, it cropped up again.

By now, WordStar ought to be smart enough to show underlining and boldfacing onscreen instead of displaying ambedded control charecters. It still isn't. And surely its "Fatal Error" messaga, a scarifying holdovar from tha olden times of computerdom, could be rewritten. The menual softens this blow not at all by cheerfully calling the message "a colorful way of saying that you're going to lose the work done in your current editing session."

MoilMerge doesn't seem to have been upgraded at all this time around. A new "conditional print" faeture (allowing, for example, mailing to selected zip codes) was added, but only to 8-bit versions, not the ona for the PC. This is anothar exemple of how MicroPro treats PC users as second-class citizens. But, evan if you already possess MoilMerge, you'll need e 3.3 version of this program to run with the new WordStor.

The same holds trua for SpellStor. It still has e small dictionary (20,000 words), it's still slow, and it still lacks faatures, lika dictionary lookup, now standard in similar programs. Its mejor edvantege is the convenience of being eble to run it from within WordStor. But because it has to run with WordStor, working on a system with single-sided drives cen be difficult. Although the new documentation claimed that SpellStor will work from either drive A or the logged disk drive, the version sant to me workad properly only from drive A.

### Now Comes the Bite

If you are currently a WordStor registered user, pleese sit down e moment. Taka a daap breath.

Reedy? MicroPro wants $85 eoch for the 3.3 versions of WordStor, MoilMerge, and SpellStor. Wa ere talking about a total of $255 here. Is that clear?

Was that tha word "arrogant" you just screamed? Or wes it something worse? Remember, with the new versions of SpellStor and MoilMerge, we ere telking about two programs that are substantially unchonged. Tha only reason you need them is that their old varsions won't run with the new version of WordStor. Aside from the improved menual, WordStor itself has only one mejor modification.

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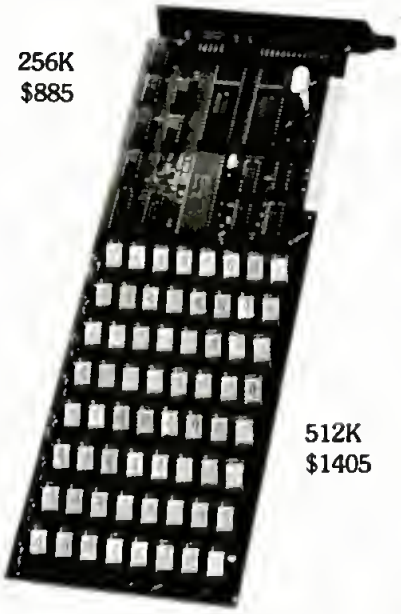
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CIRCLE 508 ON READER SERVICE CARD

DOS 2.0, the naw WordStor isn't really designed for it. Running MicroPro's programs with the PC-DOS R command can still hang up the system. When run from hard disk, WordStor won't find its ovarlays or files in subdirectorias, forcing you to clutter up the disk with multiple copias of tha overlays. Clearly MicroPro will have to address this problem somatime: wa can undoubtedly look for yet another version of WordStor down tha road.

***StarIndex will generate indexes, tables of contents, and lists of figures and tables.***

For your $85 you will gat, as MicroPro is quick to point out, all the new documentation and bindars along with tha disks. But, if you've already mastered the programs, surely you can get along without expensive new manuals. And if you're thinking that your dealer will give you a discount on tha update, think again. This updata will ba handled directly through MicroPro. Somahow I think this $85 figure, unlike the firm's othar wildly inflatad and widely discountad list prices, is graven in stone.

If this is the case, I axpect "unauthorized copies" will be produced on a massive scale since WordStor, to MicroPro's continuad credit, is still not copy-protected. If you gat your update from a pirate, though, MicroPro needn't deign to deal with you next time thara's an updata. Mayba the manufacturer planned it that way all along.

MicroPro is trying to turn its software family into an intagrated environment. A forthcoming product, called StorBurst, will serve as a "shall" of menus that will let you run varlous "Star" family programs, and possibly othars, without avar having to look at a PC-DOS prompt.

More enhancamants for WordStor will be available, too. A program called StorIndex should be available for the IBM PC in July. Only the manual was available to me at press time, but it reveals that StorIndex will generata indexes, tables of contents, and lists of figures and tablas by picking out dot commands embeddad in tha proper pages in the text. It definitaly will not do footnotes. Cost: $195, but it's included free if you buy WordStor, MoilMerge, and SpellStor 3.3 as a package.

That's dandy, but, givan MicroPro's attituda toward its customers, I'm certainly in no hurry to add another of its products to my shelf—especially if it may represent another $85 when the next "major" WordStor update comes along. I suspact a lot of WordStor users will agree.

MicroPro is keeping the 3.24 versions of SpellStor and MoilMerge on the market as a "service" to those WordStor 3.20 users who aren't in the mood to spring for the big enchiladas. Certainly anyone with earlier versions should demand the 3.24 upgrade pronto—before it's too late.

### The Quality that Remains

WordStor still has a lot going for it. I've put at least a thousand pages of text through it in tha past year with few problems. Using a disk emulator and keyboard enhancer has improved its convenienca significantly. I'm still attracted to its "What you see is (pretty much) what you get" approach, and its screens are still among tha cleanast around. I do a lot of block moves; despite the Ctrl-B nuisance, WordStor handlas these in a way mora to my liking than any other program I've seen. Its nondocumant moda (N) is probably all I'll avar naad in a program editor.

I admit it. Even in spite of Ctrl-B and its stupid approach to double-spaced text, WordStor has become a trusty friend. But I would drop it like a bad habit if someone came up with a similar screen-orianted program that did a few things WordStor can't. I'd be won ovar by instant reformatting and manipulating text from two files at onca, generating footnotes and indexes simply and aasily, and producing standard ASCII files without special characters that can drive a typesettar crazy.

See, I really do lika WordStor. I just can't stand its parents. Thay always seem to treat me and my friends like the new kids on the block. */PC*


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CIRCLE 146 ON READER SERVICE CARD

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CIRCLE 114 ON READER SERVICE CARD

*Using the DEBUG program of PC-DOS you can recover lost WordStar files even after doomsaying fatal error messages appear.*

# A Fast Recovery From WordStar Disaster

You know you are good at it. You have been at it for months. Even passing strangers remark on your adeptness on the *machine*. All of the function key meanings are memorized. You dream in menu format and dot commands are child's play. You are a *WordStar* star.

But imagine a scene like this: You have two hours to present a clean report to your new boss, who isn't thrilled with technology to begin with. He only gave in on the PC purchase to let you hang yourself. Now the time for reckoning is at hand.

You have the report in your head. The outline is clear and the words are coming. *WordStar* is loaded. Sentences flow effortlessly from your fingertips and appear on the screen. Fifteen minutes left and you're paging through the text with those nifty cursor control keys. The paper is ready! SAVE and PRINT. You see

```
**DISK FULL**
>A
```

You struggle to remain civilized in an uncivilized situation.

### Postmortem Programming

Now there are several conditions under which *WordStar* will give fatal error messages and return you to PC-DOS. The most common are saving to a write-protected data disk or to a disk that is full, read/write errors, and instituting a backwards search on a long document file. For most of these conditions, the *WordStar* manual provides instructions that will normally recover your data unless you have reloaded *WordStar*, turned the PC off, or have for any reason failed to follow the Instructions to the letter.

Though *WordStar* automatically returns to PC-DOS under such conditions, the lost document file can usually be recovered in its entirety even though the *WordStar* session terminated abnormally before the revised document was saved to disk. The file's data will still be available In the PC's random access memory if no other action has taken place to erase or

```
04A5:8520  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00  ................
04A5:8530  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00  ................
04A5:8540  00 00 00 00 00 00 00 00-0D 0A 0D 0A 0D 0A A0 A0  ..............
04A5:8550  A0 A0 20 20 20 20 20 20-02 41 20 54 57 4F 2D 4D          .A TWO-M
04A5:8560  49 4E 55 54 45 20 52 45-43 4F 56 45 52 59 20 46  INUTE RECOVERY F
04A5:8570  52 4F 4D 20 57 4F 52 44-53 54 41 52 20 44 49 53  ROM WORDSTAR DIS
04A5:8580  41 53 54 45 52 02 0D 0A-0D 0A A0 A0 A0 A0 20 20  ASTER.....
04A5:8590  20 59 6F 75 20 6B 6E 6F-F7 A0 20 79 6F F5 20 61   You know  you a
04A5:85A0  72 E5 20 67 6F 6F E4 20-61 F4 20 69 74 AE A0 59  re good at it. Y
04A5:85B0  6F F5 20 68 61 76 E5 20-62 65 65 EE 20 61 F4 20  ou have been at
04A5:85C0  69 F4 A0 66 6F F2 20 8D-0A 8D 0A A0 A0 A0 A0 6D  it for ....    m
04A5:85D0  6F 6E 74 68 73 AE A0 20-45 76 65 EE 20 73 74 72  onths.  Even str
04A5:85E0  61 6E 67 65 72 F3 20 70-61 73 73 69 6E 67 20 62  angers passing b
04A5:85F0  79 20 72 65 6D 61 72 E8-20 61 F4 20 79 6F 75 F2  y remark at your
04A5:8600  0D 0A 0D 0A A0 A0 A0 A0-61 64 65 70 74 6E 65 73  ....    adeptnes
04A5:8610  F3 A0 20 6F EE A0 20 54-48 C5 A0 20 4D 41 43 48  s  on  THE  MACH
04A5:8620  49 4E 45 AE A0 20 41 6C-EC 20 6F E6 A0 20 74 68  INE.  All of th
04A5:8630  E5 A0 20 66 75 6E 63 74-69 6F EE A0 20 68 65 F9  e  function  key
04A5:8640  20 8D 0A 8D 0A A0 A0 A0-A0 6D 65 61 6E 69 6E 67   ....     meaning
04A5:8650  73 20 61 72 E5 20 6D 65-6D 6F 72 69 7A 65 64 AE  s are memorized.
04A5:8660  20 59 6F F5 20 64 72 65-61 ED 20 69 EE 20 6D 65   You dream in me
04A5:8670  6E F5 20 66 6F 72 6D 61-F4 20 61 6E E4 20 64 6F  nu format and do
04A5:8680  F4 20 8D 0A 8D 0A A0 A0-A0 A0 63 6F 6D 6D 61 6E  t ....    comman
04A5:8690  64 73 20 61 72 65                               ds are
```

*Figure 1: While in PC-DOS, this DEBUG screen shows the beginning of the "lost" WordStar file, recovered from the PC's RAM. This file begins ot locotion 8559.*

overlay memory in tha interim.

Tha recovery procedure utilizes the DEBUG program that comes with your PC-DOS disk. DEBUG is used to locate tha text of your document in memory, name a file on disk on which to write, calculate tha size of your documant, and finally writa the section of RAM where the text resides to your disk. When your data is on disk, loading a file within WordStor is business as usual.

### Resurrecting a File

Tha steps in the procedure are easy.

- The first thing to remember is to leave the PC turned on!
- Insert the PC-DOS disk in drive A.
- When you see the A> prompt, type DEBUG. You will get a new prompt character, a dash.
- Type D O4A5:7000 FFF0.
- The screen will then display the contents of memory between the locations specified in the abova D command. In a 128K machine, the first address that WordStor uses to store taxt is usually abova 04A5:7000 in WordStor 3.24 and above 04A5:8000 for older verslons. (See Figure 1.)
- You will see the beginning of your text on the right side ol the screen. Hit Ctrl-Num Lock to stop the scrolling when your data appears. Write down the beginning address, then hit any key to look for tha and of your documant.
- As tha text is displayad on the screen, watch for the end of character data and the beginning of a series of symbols that ara not alphanumeric. Hit Ctrl-Break to stop the scrolling and you will see the dash prompt (-) again.
- On paper, mark down the address ol tha line following your text.
- If you are adverse to hex arithmetic, DEBUG will calculate the length of your documant if you type H (address 1) (address 2). The second number that DEBUG returns will be the result of address 1 minus address 2.
- Name the file on disk that you will writa to by typing N (filespec), then press Return. Preceda the name with B: if you are writing to the B drive.
- Set tha PC registars BX and CX (responsible for controlling the number of records to be writtan) by typing
  R, then Return
  BX (length of text in hex), then Return.
  CX (same as BX value), then Return.
- Write tha file by typing W (beginning address), than Return.

Now you will hear the file being written to a disk, which will be music to your ears. When this is finished type Q (for Quit), then Return. Load WordStor and get the new file with tha D command. You may have to clean up the document a bit if the length you specified was not its exact size; however, you will find that tha entire text has been recoverad.

See Figure 2 for a screan showing tha execution of this recovery procedure. You may have to modify this slightly for a single-drive system. A note of caution: Word-

***IF YOU ARE adverse to hex arithmetic, DEBUG will calculate the length of your document.***

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CIRCLE 409 ON READER SERVICE CARD

Stor begins to overlay memory when 10 pages of text are paged down or entered. You may not get all of your data, but you will get most of a large file. Figure 3 is proof that thare is life after fatal errors.

### Further Recovery

Of coursa, a recovery from WordStor is only tha beginning of tha many magical things you can do with DEBUG. After an abnormal ending from many commercial programs and utilities or custom-writtan programs, lost data can be recovered by invoking this tool.

Typically, database managers, spreadsheets, and word processors work under the same general rules, that is, they capitalize on the amount of RAM available and keep as much data as possible before overlaying memory. So let your imagination wander and DEBUG recover. */PC*

*Randy Bennett is o reseorcher ond Roger Kershow is o systems monoger for the Educotionol Testing Service in Princeton, New Jersey.*

```
04A5:9B30  72 67 65 20 66 69 6C 65-2E 20 20 20 20 20 20 0D   rge file.      .
04A5:9B40  0A 0D 0A 0D 0A 0D 0A 47-6F 6F 64 20 4C 75 63 6B   .......Good Luck
04A5:9B50  21 0D 0A 0D 0A 1A 1A 1A-1A 1A 1A 1A 1A 1A 1A 1A   !...............
04A5:9B60  1A 1A 1A 1A 1A 1A 1A 1A-1A 1A 1A 1A 1A 1A 1A 1A   ................
04A5:9B70  1A 1A 1A 1A 1A 1A 1A 1A-1A 1A 1A 1A 1A 1A 1A 1A   ................
04A5:9B80  1A 1A 1A 1A 1A 1A 1A 1A-1A 1A 1A 1A 1A 1A 1A 1A   ................
04A5:9B90  1A 1A 1A 1A 1A 1A 1A 1A-1A 1A 1A 1A 1A 1A 1A 1A   ................
04A5:9BA0  1A 1A 1A 1A 1A 1A 1A 1A-1A 1A 1A 1A 1A 1A 1A 1A   ................
04A5:9BB0  1A 1A 1A 1A 1A 1A 1A 1A-1A 1A 1A 1A 1A 1A 1A 1A   ................
04A5:9BC0  1A 1A 1A 1A 1A 1A 1A 1A-00 00 00 00 00 00 00 00   ................

-H 9B60 8559
20B9  1607
-N A:RESTORE
-R BX
BX 0000
:1607
-R CX
CX 0000
:1607
-W 04A5:8559
Writing 1607 bytes
-Q

A>WS
```

- The file ends at location 7B54.
- The H command in DEBUG mode uses hex arithmetic to calculate the size of the documant.
- N names the file to which you will write the data.
- R initializes the BX register to the size of the document.
- The second R initializes the CX register to the size of the document.
- W followed by tha baginning address writes tha document to disk.
- The computer responds by telling you it has written the document.
- Q exits from DEBUG mode.
- The A> prompt returns you to PC-DOS, where you can load WordStor and be ready to edit the recovered document with the D command.

*Figure 2: A screen showing the end of the "lost" WordStar file recovered from RAM, followed by the prompts and commands used to write this file to a disk.*

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CIRCLE 432 ON READER SERVICE CARD

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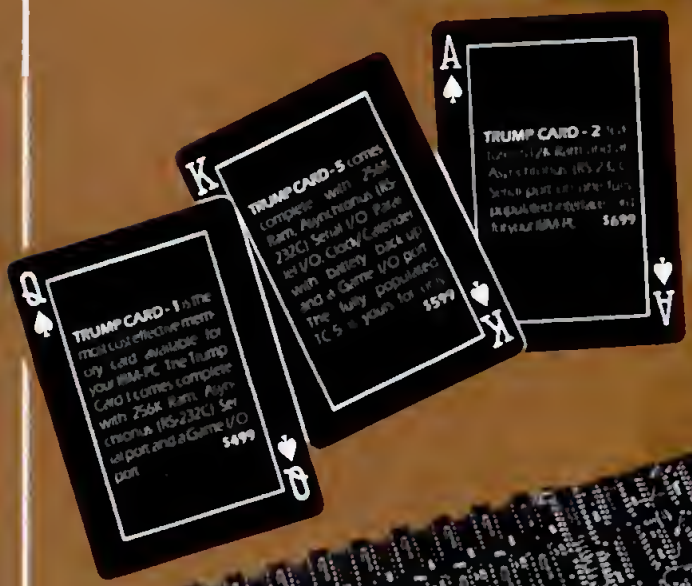


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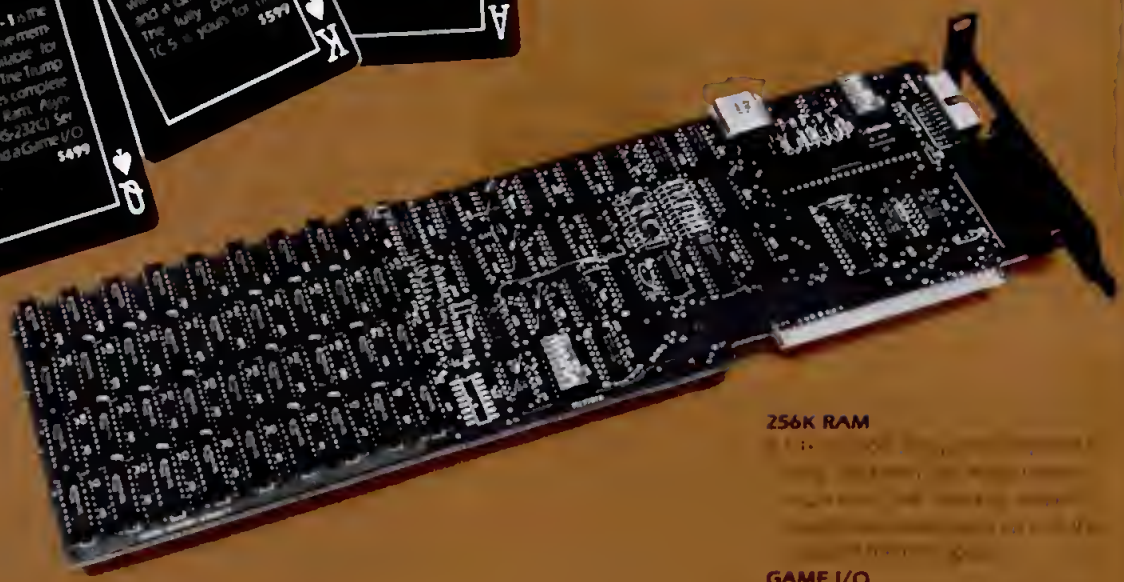
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```
        A:RESTORE  PAGE 1 LINE 1 COL 01                INSERT ON
                    < < <      M A I N   M E N U       > > >
    --Cursor Movement--      ! -Delete- !   -Miscellaneous-  !  -Other  Menus-
  ^S char left ^D char right !^G  char  ! ^I Tab   ^B Reform ! (from Main only)
  ^A word left ^F word right !DEL chr lf! ^V INSERT ON/OFF   !^J Help  ^K Block
  ^E line  up  ^X line down  !^T word rt!^L Find/Replce again!^Q Quick ^P Print
       --Scrolling--         !^Y  line  !RETURN End paragraph!^O Onscreen
  ^Z line up   ^W line down  !          ! ^N Insert a RETURN  !
  ^C screen up ^R screen down!          ! ^U Stop a command   !
L----!----!----!----!----!----!----!----!----!----!----!--------R
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*Figure 3: The recovered WordStar file, ready to edit.*


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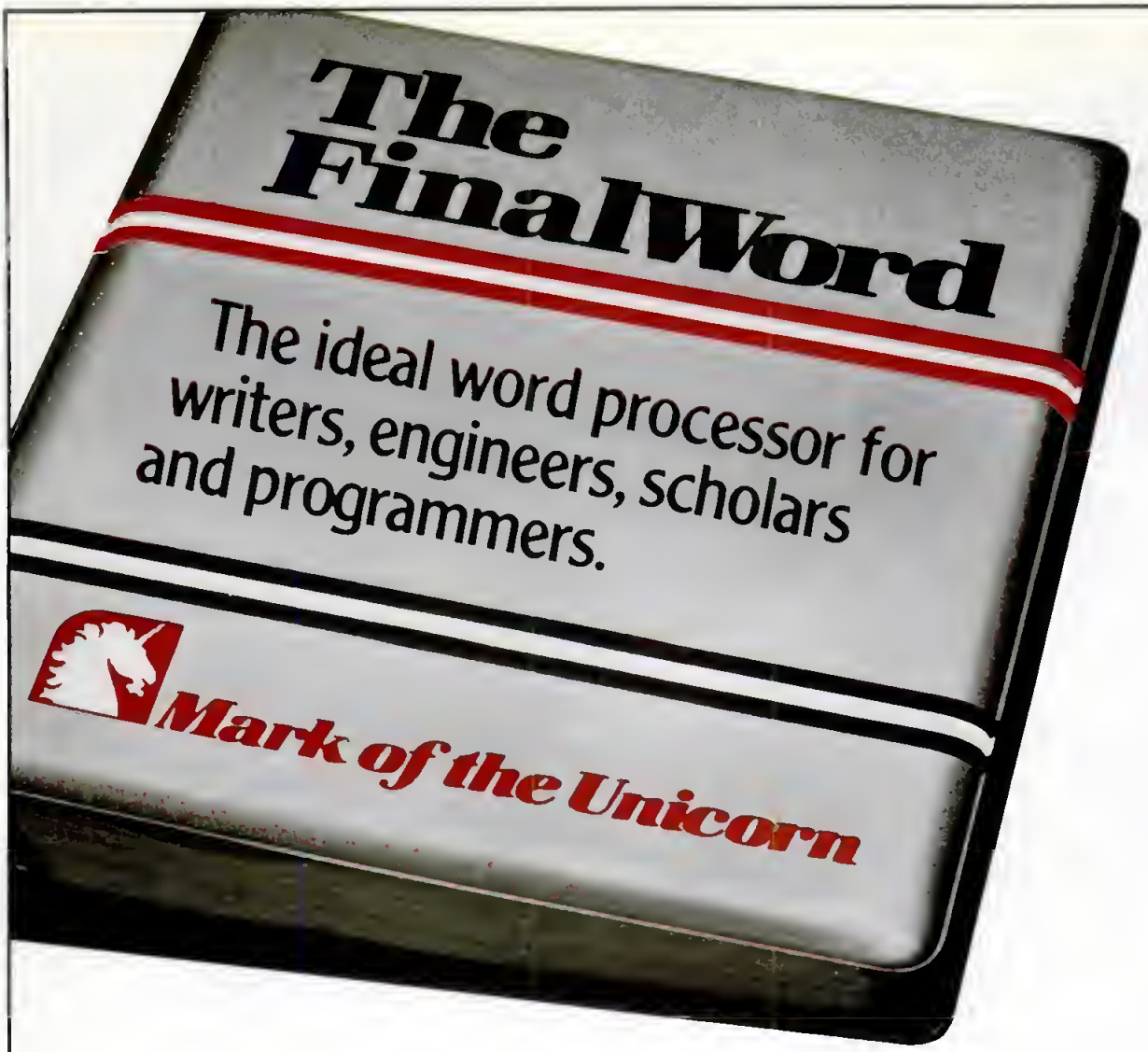
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# Defining Function Keys With PC-DOS 2.0

PC-DOS 2.0 is pecked full of new feetures. One is its ebility to redefine the function of eny key on the keyboard. Most often, users will want to redefine the ten function keys. In the following sections I will explein how to define function keys, tell how to use them, end elert you to some of the pitfells. In eddition, I will compare this capability of PC-DOS 2.0 with software peckages sucb es ProKey, designed specifically for this purpose.

## Hidden Talents of 2.0

An item in PC-DOS 2.0 that is rarely looked et is the ANSI terminal handler, conteined in the file called ANSI.SYS. When in memory, the ANSI terminel handler interprets special character sequences written to the console. Since each of these special sequences begins with the Escape charecter, these are called "escape sequences." The Escape charecter (ASCII 27) is referred to es Esc.

Oddly enough, many writers seem to overlook the potentiel of the ANSI driver. For exemple, Alen Boyd, in the April 1983 issue of *Softolk for the IBM*, stetes thet "This fecility is of little interest unless you are the rare user with e remote terminel atteched to your PC. . ." As I hope to show in this article, such is not the case.

Basically, the ANSI terminal handler defines a way of positioning the cursor and setting certein terminal ettributes. For example, if a program were to write the sequence "Esc[12;43f", the cursor would be positioned at line 12, column 43. Other sequences control blinking, underlining, erasing to end of line, clearing the screen, etc. Thus, from eny lenguege (Pascal, BASIC, C, essembler, or whet-heve-you) you can precisely control the appearance of the screen. In addition, the ANSI terminel bandler provides programmers with a tool for developing easily transportable software for competible computers, regardless of the specific terminal characteristics of eacb computer.

The Keyboard Key Reassignment (KKR) escape sequence is of special interest. Tbe KKR sequence esteblishes e new set of ASCII characters that are to be issued whenever the designeted key is depressed. For example, one could define the F1 key to be "DIR A:". According to the PC-DOS 2.0 menuel, eny key on the keyboard can be reassigned, even the QWERTY keys. The manuel, however, provides very little documentation on the KKR sequence. Worse, there are undocumented limitations!

Without getting too technical, PC-DOS 2.0 sets up e speciel erea of memory es e look-up teble for each key thet you redefine. This look-up table is limited to 128 bytes. Thus, if you attempt to define too many keys, or use long character sequences on too many keys, the teble size is exceeded. If care is not taken, it will be exceeded to the extent thet PC-DOS 2.0 meets it maker end you must reboot!

I speak from experience—I ren into the 128 byte limit like e brick wall. Knowing full well the difficulty others have bad getting enswers to technical questions from IBM through their local store, I dreaded calling my dealer. However, I learned that CompuShop and IBM are currently testing a new user bot line service. I received an enswer to my question concerning the size of the look-up teble in two hours. Good work, IBM!

## A Program for Redefinition

Now, how do you use this new PC-DOS capebility? First of ell, you must have a file on your boot disk called CONFIG.SYS. Tbis file is read automatically by PC-DOS at boot time to determine the system configuration. In order to define the function keys, you must beve a "DEVICE = ANSI.SYS" statement in the CONFIG.SYS file. This stetement loeds the ANSI terminal handler into memory. (The PC-DOS 2.0 menuel includes more dete ebout other options for the CONFIG.SYS file.)

Next, you must print a KKR sequence to the screen for each key to be defined. Since this can be tedious, I developed a special C language program for this purpose. This program, FUNKEY, is designed specifically for defining the function keys

*Figure 1: Listing of FUNKEY, a C language program to redefine the function keys.*

```
/*      FUNKEY.C - a program for defining function Keys  */
/*                                                       */
/*      Copyright (C) 1983 Kenneth W. Wood               */

#define SEQ "\033[0;"     /* initial sequence to ANSI driver */

#include "stdio.h"        /* copy in the standard I/O routines */

main(argc,argv)
int argc;
char *argv[];

{
  FILE *fp, *fopen();

  if (argc ==1)
    {
      printf("\nEnter new key definitions\n\n");
      fkey(stdin);         /* get input from keyboard */
    }
  else
    {
      fp = fopen(*++argv,"r");
      fkey(fp);           /* get input from file */
    }
}

int count = 0;    /* counter for tracking size of table */

fkey(fp)
FILE *fp;
{
  int c,offset;
  /* input character and function key identifier */

  while((c=getch(fp)) != EOF)
  {
    switch (c)
    {
     case 'F':             /* F1 through F10 */
       offset = 58;
       func(getch(fp),offset,fp);
       break;
     case 'S':             /* Shift F1 through F10 */
       offset = 83;
       func(getch(fp),offset,fp);
       break;
     case 'C':             /* Control F1 through F10 */
       offset = 93;
       func(getch(fp),offset,fp);
       break;
     case 'A':             /* Alt F1 through F10 */
       offset = 103;
       func(getch(fp),offset,fp);
       break;
     default:
       printf("Unknown function key\n");
       break;
    }
  }
}
```

F1 to F10, as well as Shift, Ctrl, and Alt in combination with the ten function keys. FUNKEY accepts a list of function key definitions as input and issues the appropriate KKR sequences as output. The program does not provide for the arbitrary redefinition of any or all keys on the keyboard. Semple function key definition files are discussed in the next section. The program is shown in Figure 1.

***THE FILE STAR.KEY could contain a list of function key definitions for WordStar.***

I created FUNKEY using the Computer Innovations, Inc. C language compiler, CI-C86. This is one of the few C compilers for the IBM PC that includes all standard C language features. FUNKEY, however, only involves simple input and output commands, so any adequate C compiler should be eble to run this program. Similar programs could also be written in Pascal, BASIC, or other languages.

Use of the program is straightforward. When you type FUNKEY, the program is loaded into memory and begins execution. To define F3 as "CHKDSK B:" you simply type F3=CHKDSK B: then hit Return. After defining the desired keys, type a Ctrl-Z and hit Return. For a large number of keys, this method is inconvenient. Instead, you can type FUNKEY FILE.KEY to have the list of function key definitions taken from the file. For example, the file STAR.KEY could contain a list of function key definitions for WordStar.

## FUNKEY Applications

This article will not concentrate on programming techniques involved in FUNKEY. Instead, my emphasis is upon various ways of using the function key definition capability. The program provided here should be viewed as a foundation on which to build a more user-friendly key definition program. To increase the flexibility of the program somewhat, each

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function key definition is normally terminated with a space. However, if you need a command to end with a carriage return, simply use the "!" as the last character of that function key definition.

Applications of function key definitions fall into two broad categories: defining keys to issue commands, and defining keys with specific strings for use in an application. As an example for the first category, I find that DIR, TYPE, COPY, and CHKDSK are among the most common PC-DOS commands that I use. The file shown in Figure 2 illustrates the set of function keys for use at the PC-DOS command level. By including "FUNKEY DOS.KEY" in my autoexec.bat file, each time I use PC-DOS, I find all of the commands are just a function key away.

There are many ways that you can use the function keys at the PC-DOS level. For example, one key could be set up as "CHKDSK A:", and another as "CHKDSK B:". However, this approach is inefficient, since the same command appears on more than one key. I chose to set up F1 and F2 as "A:" and "B:". Then, by combining another command key with either F1 or F2 I can specify either disk. For example, typing F4 ("CHKDSK") then F2 ("B:") issues the "CHKDSK B:" command.

### Redefining Problems

A few potential problems should be considered. First of all, many popular programs already make special use of the function keys. For example, the program I principally use is *The FinalWord*. All of the function keys are already defined by this software and they can be customized with a *FinalWord* utility. The PC-DOS function key definitions, discussed above, would override the *FinalWord* definitions since they are intercepted by the operating system and passed to the program. How-

***THERE ARE many ways that you can use the function keys at the PC-DOS level.***

*Figure 1: Listing of FUNKEY, continued.*

```
getch(fp)
/* throw away white space until a character */
FILE *fp;
{
int x;

  while((x=getc(fp)) ==' '||x=='\n'||x=='\t')
    ; /* ignore white space */
  return(x);
}


func(c,offset,fp)
/* send out the required definition sequence */
int c,offset;
FILE *fp;
{
  int x,save;

  save = ' ';
  while ((x=getch(fp)) != '=')
    if (x=='0') c=':';
   /* read until get = sign */
   /* if character is 0 then F10 was chosen rather */
   /* rather than F1. Change c so that offset is   */
   /* calculated correctly */
  printf(SEQ);
  printf("%d",offset+(c-'0'));
  putchar(';');
  putchar('"');
  while ((x=getc(fp)) != '\n')
   {
   if (x != '!')
    {
     putchar(x);
     if ((count = count+1) == 128)
     {
      printf("\nTable size exceeded. Program terminated...\n");
      exit();
     }
    }
     else
        save = x;
   }
  putchar('"'); '
  if (save == '!')
    printf(";13p");
  else
     printf(";32p");
  save = ' ';
  if ((count=count+1) == 128)
  {
  printf("\nTable size exceeded. Program terminated...\n");
  exit();
  }
}

/*  End of listing   */
```

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*Figure 2: After running FUNKEY, the following PC-DOS 2.0 commonds ore ossigned to the ten function keys. F1 to F10 ore the input file nomes of the function keys in their normol stote; C1 to C10 ore the nomes for the keys in combinotion with the Ctrl key.*

```
F1=A:       C1=MORE
F2=B:       C2=FIND
F3=DIR      C3=SORT
F4=CHKDSK   C4=MODE
F5=COPY     C5=PATH
F6=ERASE    C6=TREE
F7=TYPE     C7=MKDIR
F8=PRINT    C8=RMDIR
F9=RENAME   C9=RECOVER
F10=CLS     C10=FORMAT
```

ever, there is no documented way to clear the definitions you use. So far, the only method I know of to restore the default set of key definitions is to reboot the system. This was confirmed by IBM.

On the other hand, the fact that your definitions override existing definitions cen be e blessing as well. As Corey Sandler pointed out in "Doing It Your Way With ProKey" (PC Mogozine, Volume 1, Number 9), some of the choices made by MicroPro for the PC-DOS function keys defy logic. The key arrangements in many other programs are equally illogical. In some cases, you can use the capabilities described here. Howavar, if a program bypasses the normal operating systam calls in order to perform keyboard input, then the key definitions you craatad are also bypassed. Such is apparently the case with WordStor, since en attempt to redefine function keys for WordStor failed to over-ride the existing definitions.

Finally, each key definition sequence must end with "white space"—that is, a blank or a carriage return. The ANSI driver seems to use these charecters as separetors between new dafinitions. l triad tarminating the definitions with other characters, such as the null, with the result that all of the key definitions ran togethar into one giant sequence. There is no problem in using this capability to define strings. However, some programs do not lika a spaca or carriage return after a sequenca of control characters.

### Batching Keys and Programs Together

Using the capability to resat the function keys can create another minor prob-

***ANOTHER WAY to use function keys is with commonly used strings.***

lem. Suppose that you set the keys up for WordStor, then switched to VisiColc. The kay definitions are no longer appropriate. I find it annoying to constantly remind mysalf to switch to the proper function key set. The best way to peinlessly use the function keys is to writa a batch file for each program. The batch file takes the generic form:

```
FUNKEY APPL.KEY
Application
FUNKEY DOS.KEY
```

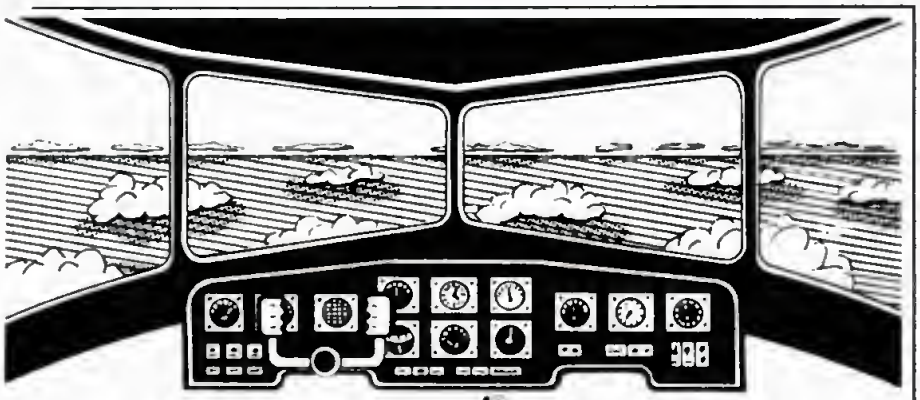
This file loads the definitions for an application, calls the application, and resets the keys for PC-DOS after you exit the application. For example, if STAR.KEY was a file of the key definitions for WordStor, than l would create e batch file called WORD.BAT. Its contents would be:

```
FUNKEY STAR.KEY
WS
FUNKEY DOS.KEY
```

To use WordStor, I call up the batch file by typing *WORD* rather then *WS*.

### Strings on Function Keys

Another way to use the function keys is with commonly used strings. For example, suppose that your compeny nama is "Federated Software Arts and Science, Inc." You could assign a string with the company name to a function key. Than, as you use your word processor, whenever the company nama is needad, you just

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PCA-I

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press that function key. Or, in writing an article on a specific subject, frequently used lengthy terms such as "operational transconductance amplifier" can be assigned to function keys and used as needed. If you do this, remember that PC-DOS restricts you to 128 charecters as the total for all the keys thet you define.

**Programs with Better Definition**

I am aware of et least two programs, written for use with PC-DOS 1.0 end 1.1, that provide function key capabilities: ProKey and Keynote. Both ProKey and Keynote pravide meny more key definition capebilities than PC-DOS 2.0. First of all, there is no 128 byte restriction. ProKey, for exemple, provides over 125 definable keys, and each key can be up to 1,000 characters long. Furthermore, key definitions can include "fill-in-the-blenk" fields and references to other defined keys. ProKey is memory resident, which means thet yau can change the key definitions anytime while in a program. Thus, ProKey can provide a macro-like capability. The possibilities provided by ProKey or Keynote are endless. For more information and potential applications, see "Doing It Your Wey With ProKey" (PC Mogozine, Volume 1, Number 9.)

## *THE TIME you spend exploring PC-DOS 2.0 can be well worthwhile.*

Function key redefinition is one of the new capabilities provided by PC-DOS 2.0. Although useful, this capability is still limited compared to commercial programs designed specifically for the purpose. However, the examples in this article should illustrate thet the time you spend exploring PC-DOS 2.0 can be well worthwhile. Who knows what additional capabilities lie hidden within the code of PC-DOS 2.0? */PC*

*Kenneth Wood is a software systems engineer for Texos Instruments in the Dallos, Texas area.*


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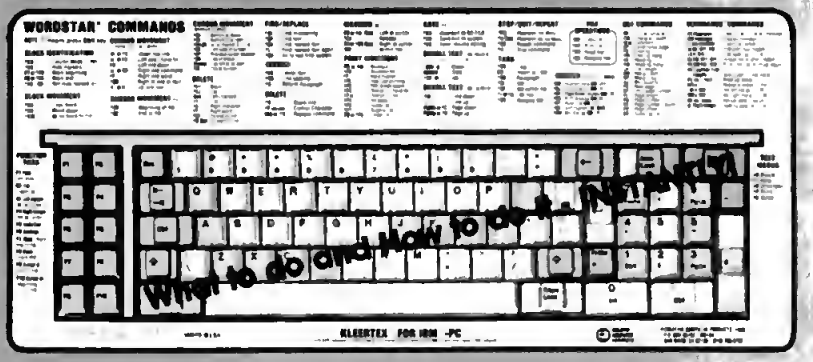
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Arthur Naiman, for one, in the "Word Processing Buyer's Guide" to be published soon by McGraw-Hill.

In his definitive study, Naiman compared 14 major word processing products—and PIE:Writer was among the top three. Its nearest neighbors were dedicated word processors which cost from $13,500 to $15,000. (See a portion of the study results below.) Yet PIE:Writer can be part of your personal computer system for just $149.95!

So now your business or home microcomputer can have capabilities equivalent to the industry's top machines. Naiman says:

**"PIE:Writer, running on a humble Apple II, outscored every other word processing program for microcomputers . . . (It) crams an incredible amount of power into a small (23½ K) and inexpensive package . . . PIE:Writer beat four out of six dedicated word processors."**

| | Operating system(s) and/or machine(s) | Price | Overall Score |
|---|---|---|---|
| CPT 8100 | dedicated word processor* | $15,000 | 94¾ |
| Dictaphone Dual Disp. | dedicated word processor* | $13,500 | 85¼ |
| **PIE:Writer:** | **Apple II, IBM PC** | **$149.95 $199.95** | **84¼** |
| A.B. Dick Magna SL | dedicated word processor* | $14,500 | 83 |
| Write | CP/M† | $400 | 82¼ |

*Includes word processing hardware & multistation support

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No other microcomputer word processor earned the ranking that PIE:Writer did. PIE:Writer can make your personal computer into a word processing whiz.

### That's not all.

PIE:Writer has been steadily collecting honors from experts throughout the industry for its all-around price/performance and its many advanced user features.

When Peelings II magazine compared 10 micro word processors, PIE:Writer came out on top . . . again. Peelings II rated PIE:Writer "AA+" and defined the rating as ". . . top notch, superb." The review concluded:

**". . . a formidable contender in performance to price ratio . . . PIE:Writer is hard to beat."**

And Interface Age said in an in-depth review of PIE:Writer's current version:

**". . . much has been gained in this update to a time-tested classic."**

## Why the experts love PIE:Writer.

Why all the fuss?

Here are some of the features reviewers chose as the basis for PIE:Writer's excellent performance, and the reasons why you should choose PIE:Writer:

PIE:Writer is fast in executing functions such as search, scroll, page up and down.

PIE:Writer is easy to learn, with an excellent new set of user documentation.

PIE:Writer is copyable to back-up disks.

PIE:Writer can edit either text or programming code.

PIE:Writer is compatible with a wide range of hardware.

And reviewers note that PIE:Writer has refined the most sought-after editing features:

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- ✓ global word search & replace
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## You'll love PIE:Writer too.

You'll find everything you need in PIE:Writer. Whatever you write will be easier to do: reports, letters, books and articles, memos and personal notes. Use PIE:Writer with a 40 or 80 column set-up, lower case adapters, hard disks, modems or shift-key modifiers. PIE:Writer works with spelling checkers, Visi Calc* files and can edit program source files.

PIE:Writer gives you efficiency and capabilities far beyond other word processors. You can save valuable time and be more creative with all your documents. And PIE:Writer is an easy transition for typists as well as writers and managers.

You'll be using PIE:Writer the day you install it on your personal computer. Just a few moments with its built-in training lessons and you're up and running.

The experts use words like "powerful," "clean," "formidable" and "graceful" to describe PIE:Writer. But don't take their words for it. Try PIE:Writer yourself and enjoy the ease and excitement of the top-ranked word processor.

## The Hayden Advantage.

There's another significant reason to love PIE:Writer: it's backed by Hayden Software, a company with the experience and resources to provide solid products; thorough, user-friendly documentation; and full technical support.

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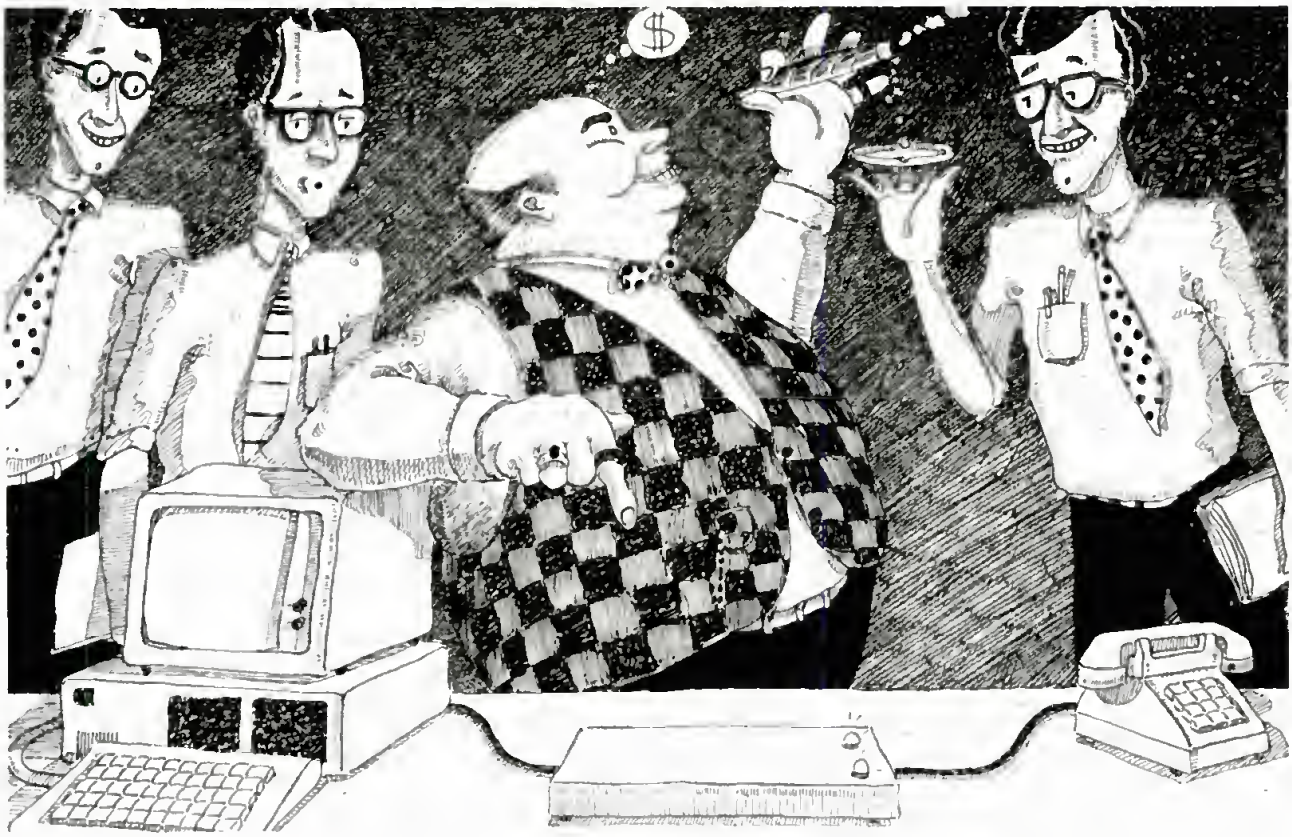


Illustration: Stuart Bradford

Auto Dioler
Aiphanetics
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Forestville, CA 95436
(707) 887-7237
**List Price:** $29.95
**Requires:** 64K RAM, one disk drive, Hayes Smartmodem.

**CIRCLE 690 ON READER SERVICE CARD**

Before we begin, one question. Why would anyone buy a program that does nothing more than store phone numbers and dial them automatically? I can think of three answers. To show off the computer to friends. To call relatives or business associates, one right after the other, in order to give them each a similar message ("It's a boy!" or "The labels on the bottles of Ipecac and Dramamine were switched.") Or quite possibly, to take the sting out of the $600-plus price tag for the Hayes Smartmodem 1200 required to make this program work.

There's bound to be someone out there who will decide he needs Auto Dioler because he doesn't want to bother dialing someone's number manually. So after he gets it, he will (1) remove the dust cover from his PC, (2) look for his DOS disk and insert it, (3) turn his computer on, (4) wait for it to boot, (5) look for the Auto Dioler disk and insert it, (6) fumble through the first few program steps to get to the automatic dialing menu, (7) turn on his modem, and (8) hit the proper sequence of keys. It is possible to make the disk autobooting and to skip the dust cover routine, but that still leaves a half-dozen steps.

Perhaps Auto *Dioler* was created simply because everyone hates to look up numbers and punch or dial them in. Or because it's neater to keep your telephone numbers on a disk rather than scribbled on scraps of paper or the backs of envelopes end cocktail napkins. But is this really necessary?

The program hails from Alphanetics, a company that edvertises games such as *Contraband* ("You're a smuggler . . . dealing in illegal drugs . . . you scramble for the best deals . . . the mob had better get their cut . . . you'll play for hours just to get that one big score!") and Prosthesis ("you'll soon realize what a prescription we have for stimulating, X-RAYted fun . . . you'll be heving such exotic/erotic fun, you may never want to quit—if you can keep it up! . . . Great fun et parties!").

According to the ad, Auto *Dioler* requires a "Hays" Smartmodem, hut I suppose the one manufactured by Hayes might work. And unless the program manages to steal some shelf spece at your local computer store, you have to order it through a post office box.

### Missing Instructions

The first thing you notice when you remove the disk from its spiffy plastic bag is that there is no documentation whatsoever. There are, however, three pieces of stiff paper. One has a cutout picture of an IBM PC. The second boasts a two-sentence product description and a few lines containing the price and the company eddress. The third is a bright orenge sheet that says "This menuel is copyrighted."

*THERE IS no documentation whatsoever.*

Feir enough. Maybe the program is so easy to use thet you don't need instructions. And to tell the truth, the program is pretty simple. After all, how complex can a phone dialing program be?

When you boot Auto *Dioler*, you are offered the chance to run through a few brief one- or two-line instruction screens. Unfortunately, if you tap the space bar e dozen times, the instructions zoom by like Burma Sheve signs. Interesting philosophy here: present one and only one fact to the user at a time, as if comprehending more were out of the question. You can tell without looking at the label that this was made in California.

If you skip these koan-like instructions, you can plunge right into the guts of the program. After much sputtering and disk-churning, Auto *Dioler* confronts you with the single word "INITIALIZING." Then, every few seconds, just when you think the program has died or is hopelessly snarled in some internal Boolean crash, It grinds the disk to remind you it's still hanging in there.

You get to pick your data disk and confirm your selection. If your modem is not turned on, you get a warning. Don't have a


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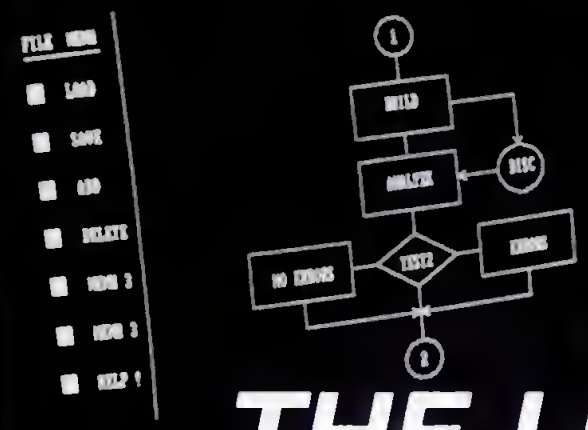
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CIRCLE 250 ON READER SERVICE CARD

modem connected? This program doesn't care. It plows blithely on. This lets you add or change names in your directory even if you don't heve e Heyes handy. If you try to dial without e modem, that's another story; you receive e repeeted stony, implacable message telling you to switch the thing on.

The Auto Dioler mein menu scrolls onto the screen, end snaps, creckles, and pops madly awey while it weits for you to meke a choice. A smell digitel clock et the top of the screen throws off clouds of little white sparks like the Van de Graaff generators in old Frankenstein films, and a dencing cursor-like object bounces uncontrollebly up and down along the left margin. The real cursor pulsates slowly in the iower right-hand corner. The main menu allows you to either edd an entry (A); dlal from a printed phone code number (B); chenge or delete entries (C); dial by neme or letter search (D); exit from Auto Dioler or select deta drive (E); get a printout of your phone number list, (F); chenge modem specifications (G); or chenge COMMNET parameters (H).

### Entering Your Directory

Before you decide to purchese Auto Dioler, the first thing you might want to do is see whet names come with the system. All thet were in ours were five dead American presidents and the Newfoundland, Canade, office of Jordeche Jeans. Must have been a wild party.

Since I couldn't imegine ever needing any of those numbers, I erased them. This is not as easy es it sounds. First, you have to print out e list so you can see what nemes you went to erase. Then, you heve to go into the delete mode and enter either the lest name or part of it. To the program's credit, it uses single keystroke commands in most pleces and has many built-in two-step verifications and data protections.

*AFTER ALL, how complex can a phone dialing program be?*

You can enter the first initial of a last name from your existing directory, then jump forward and backward by punching the plus and minus signs. Since the program must check the disk each time you want a new name, however, each request is accompanied by a symphony of drive motor coughs and wheezes. If you do want to delete e name, you must type in Y-E-S. If you only type in Y, the program thinks you mean NO. I guess this was meant to be e safeguard, but it's e trifle tedious.

The seme editing screen lets you change or delete listings, and changing an entry is predictably straightforward. Each file can include e last name (as distinguished from the given name, so the listings can be sorted alphabetically), first name, area code, phone number, and e 26-letter message. (If you want to store the alphabet you're in luck.) The only way to list separate work end home numbers or to tie related files together is to type in some cryptic reference in the comment spece.


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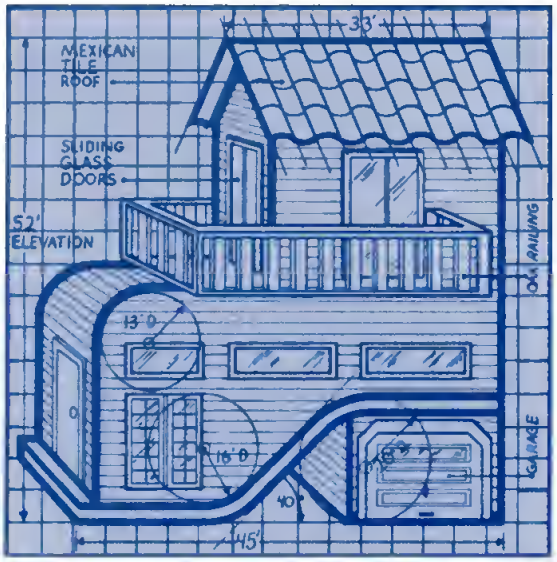
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There's no room for an address unless you're good et compressing e number, street, city, state, and zip into a spaca about two-thirds es wide es this column.

Entering informetion is elso difficult. The program does everythlng in uppercase characters only, regardless of whether you enter them in upper or lowercase.

***JUST WHEN you think the program has died, it grinds the disk to remind you it's still hanging in there.***

Although lt knows what e hyphen is when you enter a phone number, the program ignores it, which causes momentary confusion. Instead of trying to catch errors at the start, it waits until you've finished typing in the date, then stops to verify it.

You can generally jump back to the main menu from the middle of any operation, but when you try this after entering e name or going to the Enter screen, the program laboriously re-sorts all the entries in alphabetical order. While Auto *Dialer* juggles all the listings, you can pass the time dialing the phone number yourself.

Once you've copied your Rolodex onto a disk, you mey diel e number either by typing in the number thet Auto *Dialer* has assigned to the file or by typing in the lest name. Unless you're making long distance calls using e non-AT&T system, it usually takes more keystrokes to tap in the last name than to dial the number.

### More For Your Money

Of course, Auto *Dialer* does look up phone numbers. If you think this ls worth $29.95, then this program is for you. Many communications programs include autodieling feetures, however, so if you're thinking of purchasing e full-fledged telecommunications system, you might get one tossed in for free. One more thought. At e dime e throw, you might even come out ahead by dialing Information. If you could speed up the program and keep it on a hard disk, it might ba interesting to have around the office. Otherwise, it's strictly a wrong number. */PC*

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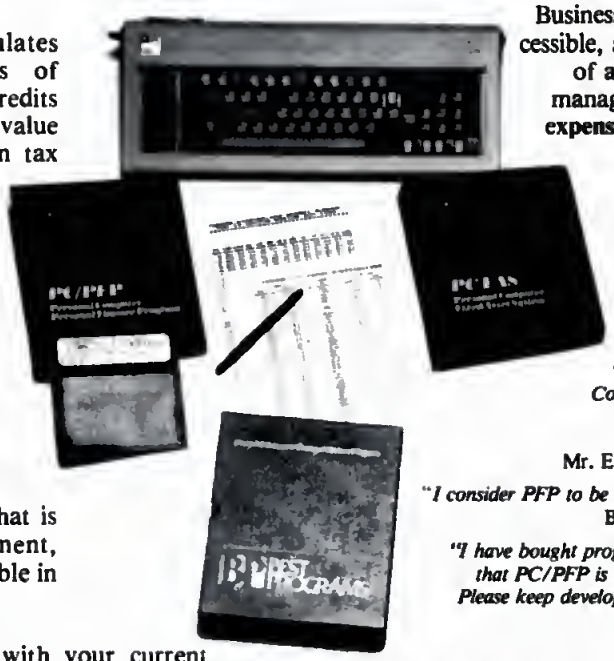
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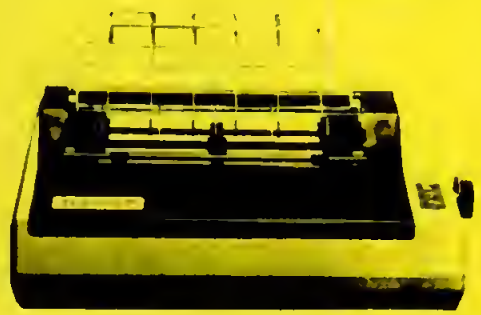
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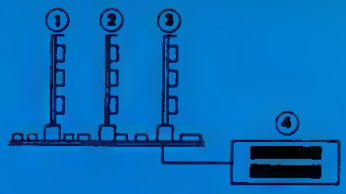
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(301) 922-3400
**List Price:** $3,395

**CIRCLE 629 ON READER SERVICE CARD**



*Front view of Columbio with optionol Amdek monochrome monitor.*

Photograph: Jack Reznicki

When first you hail the Columbia, you may find yourself doing a bit of mental measuring. In this day of smaller-is-better, Columbia Data Products has taken the more traditional approach: It has produced a "PC" grown wider, longar, and heavier. But to hear the company boast, It's also a PC grown a bit more useful, and priced at a discount.

The Columbia qualifies as a full-fledged PC work-alika. It accepts all hardware options designed for the IBM machine and runs virtually all software written for its worthy mentor. It was the first of the copycats to gain wida distribution, and has made its markat on the basis of price and feature comparisons to tha PC.

The base model Columbia MPC 1600-1 includes 128K RAM on the motharboard, two RS-232C serial ports, a Centronics parallel printer port, a color/graphics display adapter, two floppy disk drives of the same configuration as IBM's, and a Winchester hard disk drive interface. With these features already ln place, the Columbia leaves seven of its aight expansion slots open. (The PC has five slots, all of which could be taken similarly.)

Columbia has been aggressively marketing its equipment as a cost-effective alternative to IBM's product, with several reductions in price since the introduction of the machine in the summar of 1982. In late April of this year, Columbia dropped the price on the basic model to $3,395 and added into the box a packaga of software that It claims has a value of about $3,000. Tha "bundle" includes Parfect Software's word processor/spelling checkar programs *Perfect Writer* and *Perfect Speller*, the database manager *Perfect Filer*, and the spreadsheet *Perfect Calc*. (This was a slightly unusual act on tha part of Parfect Software since it meant that tha "official" release of its 8088-version package was for a PC-compatible, rathar than for the PC itself.)

In addition to these applications programs, Columbia also includes *Fost Graphs*, a business graphics program (see "Fast Graphs: Quick, Colorful, And Easy" in this issue); the *Home Accountont Plus* financial program; an asynchronous communication package; an arcade game; and

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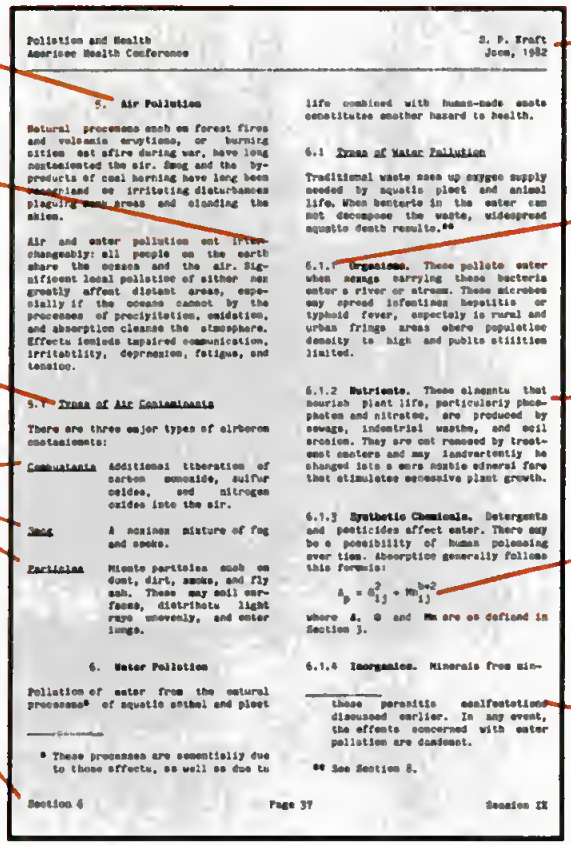
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Pollution and Health — S. P. Kraft
American Health Conference — June, 1982

5. Air Pollution

Natural processes such as forest fires and volcanic eruptions, or burning cities set afire during war, have long contaminated the air. Smog and the by-products of coal burning have long been recognized as irritating disturbances plaguing many areas and clouding the skies.

Air and water pollution are interchangeably: all people on the earth share the oceans and the air. Significant local pollution of either can greatly affect distant areas, especially if the oceans cannot by the processes of precipitation, oxidation, and absorption cleanse the atmosphere. Effects include impaired communication, irritability, depression, fatigue, and tension.

5.1 Types of Air Contaminants

There are three major types of airborne contaminants:

Combustants — Additional liberation of carbon monoxide, sulfur oxides, and nitrogen oxides into the air.

Smog — A noxious mixture of fog and smoke.

Particles — Minute particles such as dust, dirt, smoke, and fly ash. These may soil surfaces, distribute light rays unevenly, and enter lungs.

6. Water Pollution

Pollution of water from the natural processes* of aquatic animal and plant life combined with human-made waste constitutes another hazard to health.

6.1 Types of Water Pollution

Traditional waste uses up oxygen supply needed by aquatic plant and animal life. When bacteria in the water can not decompose the waste, widespread aquatic death results.**

6.1.1 Organisms. These pollute water when sewage carrying these bacteria enter a river or stream. These microbes may spread infections hepatitis or typhoid fever, especially in rural and urban fringe areas where population density is high and public utilities limited.

6.1.2 Nutrients. These elements that nourish plant life, particularly phosphates and nitrates, are produced by sewage, industrial wastes, and soil erosion. They are not removed by treatment centers and may inadvertently be changed into a more usable mineral form that stimulates excessive plant growth.

6.1.3 Synthetic Chemicals. Detergents and pesticides affect water. There may be a possibility of human poisoning over time. Absorption generally follows this formula:

$$A_p = \theta_{ij}^{n} + Mn_{ij}^{b=2}$$

where $A_p$, $\theta$ and $Mn$ are as defined in Section 3.

6.1.4 Inorganics. Minerals from min-

these parasitic manifestations discussed earlier. In any event, the effects concerned with water pollution are dandiest.

* These processes are essentially due to those effects, as well as due to

** See Section 8.

Section 6 — Page 37 — Session IX

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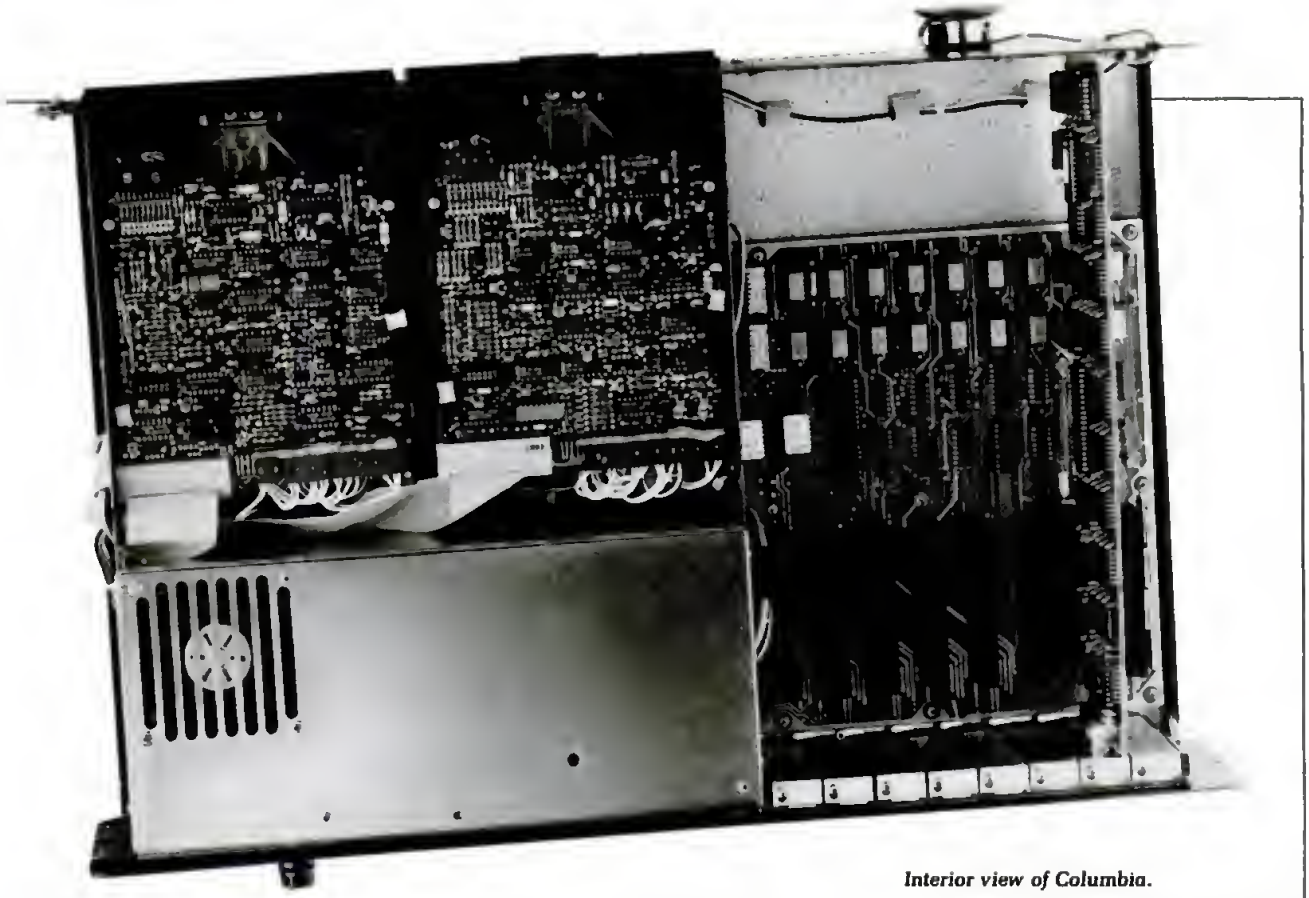
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*Interior view of Columbia.*

# Aboard the Columbia

*Capable of supporting the MS-DOS, CP/M-86, and MP/M-86 operating systems, Columbia's Multi-Personal Computer is a multi-purpose, multi-personality machine.*

The Multi-Personal Computer is the latest offering in the PC-compatible market from Columbia Data Products. its name implies that it has multiple personalities, and its advertisements imply that it is a multi-user machine. Both implications are true. The Columbia includes MS-DOS end the CP/M-86 operating systems, as well es MP/M-86, e multi-user operating system.

The Columbia's hardware design supports its multiple software personelities. The motherboard consists of an 8088 microprocessor running at 4.77 MHz, an obligatory 8259A interrupt controller, and an 8237 Direct Memory Access (DMA) controller. These components are necessary to ensure IBM compatibility. The motherboard also includes 128K RAM and eight expansion slots, as well as a floppy disk controller, two serial ports, and two parallel ports. As you might expect, it is quite a bit larger than IBM's motherboard, measuring 10 × 20-inches. It covers the entire bottom of tha cabinet. One of the parallel ports is tailored for use with a Winchester disk, with its own connector located on the front of the board. High performanca Winchesters won't use this port, however. Instead, they would use the more conventional card in one of the expansion slots. Although I didn't have an opportunity to test the Columbia with the Winchester controller and a hard disk, the specs are interesting because of the on-board cache buffering. This is the same design approach as IBM's new disk controiier, and it affords high throughput and access speeds withut burdening the central processor with hard disk control functions. A Z-80 handles all the Winchester and memory housekeeping, managing 11 8-sector buffers in its 64K on-board memory.

***IF YOU'RE A first-time user, you'd better have a good dealer behind you.***

If you are running the Columbie with MS-DOS in its IBM-compatible mode, you can instell a standard monochrome or color video display card and a keyboard—in this case, the Key Tronics IBM clone. You can use the same setup to run CP/M-86, but most CP/M machines use conventionel computer terminals rather than the keyboard/monitor/display controller card combination found in the PC. Columbia provides for this by allowing one of the serial ports to be used as the system console. Its ROM (program stored in read-only memory) supports either. If you were to run the MP/M-86 operating system, however, you would need more serial ports and more memory. The six terminais

*THE COMPARISON is $3,395 for the MPC and about $7,000 for the PC.*

a tutorial program. Finelly, the kitchen sink elso includes the MS-DOS and CP/M-86 operating systems, BASICA, and the Mecro/86 Assembler.

"If we're going to remain under IBM's umbrella, we need to meintain an edge," said John A. White, vice presidant of merketing and sales for Columbia Data, "We must offer a value better than IBM's."

How much of a value is Columbia? The list price for e comparably equipped IBM PC would be $3,437, plus the cost of e Winchester hard disk interfece and tha software package. If we take Columbie at its faca value, the comparison is $3,395 for the MPC and about $7,000 for the PC.

The top of the line for Columbia is the MPC 1600-4, which includes a 23-megabyte (10-megebyte after formetting) hard disk and a single floppy disk drive. The list price, including the software peckage, is $4,995.

### Not Bad For Rookies

Is anyone buying? According to White, shipments are expected to reach ebout 1,000 e month in May, which is "not bad for e bunch of rookias." The company is selling through a group of distributors across the country, and its products have also turned up in the listings of discount mail order operations. The company also offers a "Call for Columbia" netional sarvice program.

Columbia has not stopped in its tracks to count the incoming cash, howevar. "We want to be the only vendor with e complate line of IBM competiblas," White said, "Uniqueness is countad only in a matter of days in this industry."

According to Whita, users can look forward to thase naw products from Columbia: a PC-compatibla portabla called tha "VP," which will list for $2,995, includes two half-high disk drives and a 9-inch green screen, and will be marketed with the same package of software thet its big brother now offars; end a peir of expansion units thet offer 10- or 20-megabytas of formatted hard disk spaca for the MPC or 10 megabytes for the MPC Modal 4. Columbia hopes to maka the expansion boxes compatible with the IBM PC and the PC-XT too.

Columbie Data does not offer e machine that is inherently better than tha IBM PC. The machine works, pariod. About tha only thing you don't get with e Columbia is the IBM logo, and that is a value that can only be detarmined by the consumer himself. */PC*

*THE COLUMBIA qualifies as a full-fledged PC work-alike.*

flanking the Multi-Personal Computer in Columbla's ads may be a blt optimistic given the limitations imposed by an 8088 running et 4.77 MHz. Since serial terminals do not provide the systam reset function provided by the Ctrl-Alt-Del on the IBM-compatible keyboard, the Columbia is equipped with a reset button.

In terms of parformanca, there is no measureble difference between the Columbia and a simllerly equipped IBM PC. Of course, you do heve to loed tha antire BASICA, since there is no ROM-resident BASIC in the machine. This takes ebout a second longer. Choosing between IBM's keyboard end tha Key Tronic Soft-Touch is a matter of taste. (I prefer the Soft-Touch; I'd like it even better if it were the new kayboard that resemblas the IBM Selectric rather than e PC look-alike.)

### Hardware Design

The overall dasign of the machine is for the most part wall-conceived, although there is still room for improvament. For example, the motherboard is laid out well, with large power traces and meny bypass capecitors. It is specious and provides easy access to components. Unfortunately, a series regulator stands right in tha middle of the expansion sockets. Although this doesn't directly intarfare with the use of the sockets, you must be caraful not to bend it while inserting a board, and you must be sure that the componants on the expansion board will not hit it whan tha board is fully saated. I also wondar ebout tha design of the data separator/clock recovery circuitry in the floppy disk controller. Although most manufecturers blanket that area of the circuit board with ground planes to ensure stability, the Columbia has only standard sized traces. The circuit design is more complex than is customery, but appears reliable. Davld Howse, the designar of the Columbla, says that tha controller circuitry is now being revised for greater simplicity.

*IN CONTRAST to IBM's new PC-XT, the eight expansion slots are full-sized.*

The case itself is stamped sheet metal and its appaaranca is pleasing, but tha fit and finish are somewhat inferior to those of the competition. The power supply and disk drives are integrated into e subassembly "tray" that rides between the front and back panels. Removing it is a bit like solving a Chinese puzzle: Which piece comes out first? Although the everage user will probably never hava occasion to remova the tray, he would find it troublesome should the need arise. The disk drives are full-size Tandons, with 320K per driva. In contrast to IBM's new PC-XT, the eight expansion slots are full-sized. My test systam did not hava any card support guides, however, and the front edges of the cards were free to mova letarally, increasing tha possibility of damaging a card during installation or removal.

The documentation for the Columbia is far below the standard set by the PC end other computers in tha sama markat. It consists of e single 8½- × 11-lnch booklat containing e few pages of operating lnstructions. Most of the information it contains was copied from tha data sheets from the mejor larga-scala lntegration (LSI) chips on the motharboard. This information might be nice to know, but I can't understand why the average user

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would care about what the status blt structure of the disk controller looks like. I can undarstand why e manufacturer would shun tha expensive "book in a box" approach taken by tha leaders in the industry, but I'm at a loss for words to describe Columbia's elternative to this.

***THE COLUMBIA'S hardware design supports its multiple software personalities.***

Columbia is probably counting on the documentation provided with the operating systems and the languagas that you choose to carry you along. Although this type of documantation has come a long way, it's still the manufecturer's rasponsibility to tie it all togather. If you've elready done some systems integration and hardware axpansion on a PC, you should hava no problam doing the same on the Columbia. Similarly, experienced CP/M users will probably hava little difficulty using this machina. If you're a first-time user, however, you'd better have a good daalar behind you.

Tha power supply is rated conservatively at 100 watts, although spokesmen for Columbia say that it can supply 130 watts before its self-protection circuits break down. Two emps for the motharboard, 2 amps for the hard disk controller, plus two mora for the drivas laavas roughly 0.8 amps per expansion slot.

### Roomy

The Columbia has some attractive features, not the least of which is room for eight full-sized axpansion boards. Thase will come in handy if you opt for multiuser operetion, which may entail more memory, more I/O ports, a hard disk, and perhaps a diffarent CPU. The optional operating systems are supported by Columbia, which is important from an ease-of-instellation standpoint. Although there are a few waak spots in the overall packaga, none of them impinge on tha performance of tha Columbia, and the manufacturer is avidantly working to ovarcome them.

*—Bill Mochrone*

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Without software, a computer can't do anything. And vice versa. You have to buy both.

**Buy the software first.**

Since the reason you're buying a computer is to get the capability the software gives you (remember it's the software that tells the computer what to do), it makes good sense to pick the software first.

Start by making a list of the things you want the computer to do. Possibilities include word processing, inventory control, accounting, graphics, recordkeeping—you name it, there's probably software that does it.

Next take your list into a computer store and ask the salesperson to demonstrate software that will do the things you want.

Even though you'll need a computer for the demonstration, keep in mind the computer is just a vehicle. The software is the driver. Once you've decided on software, picking the rest of the computer system will be that much easier.

**The simpler the better.**

Some people will tell you that software has to be complicated to be powerful. Nothing could be further from the truth.

Good personal software should be, as the computer people say, "friendly." Meaning that it helps you do what you want to do without getting in the way.

Good software keeps the complications in the computer, where they belong. And keeps the capability at your fingertips. It's that simple.

**Simply see for yourself.**

You can read any number of interesting books and magazines about personal computers. You can ask your friends who have them.




Or look at all the sales literature you can get your hands on.

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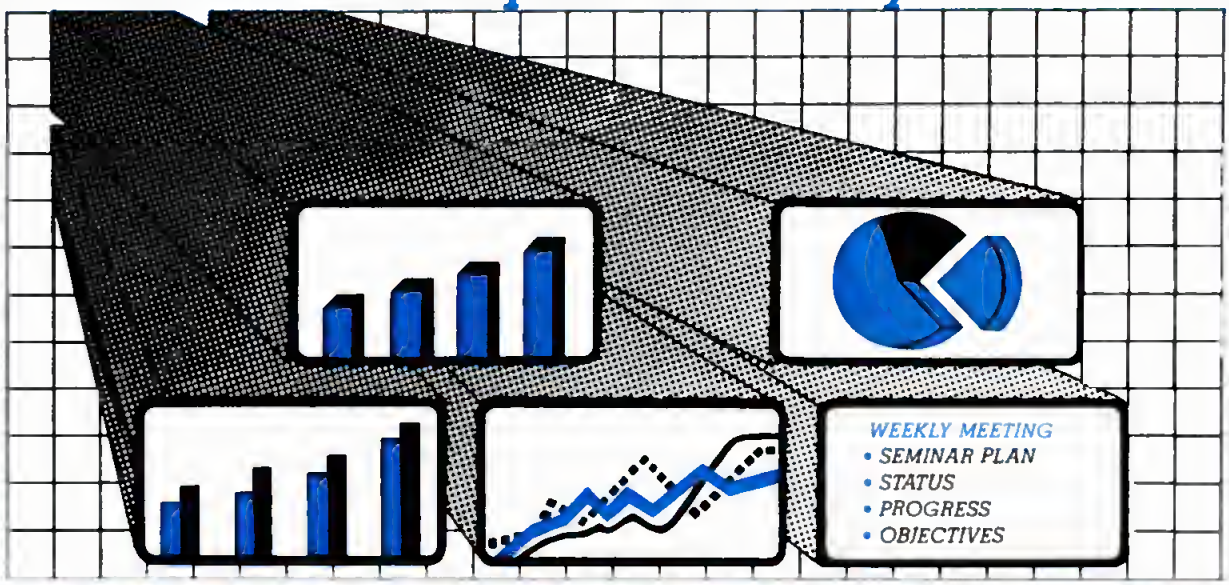
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CIRCLE 257 ON READER SERVICE CARD

*Flight-related games for the PC are akin to pre-Wright Brothers attempts to take wing: good ideas that never really get off the ground.*

# Terminal Jet Lag

*Flight Command*
Lighthouse Distributing
P.O. Box 10938
Bainbridge Island, WA 98110
(206) 842-5557
**List Price:** $49.95
**Requires:** 64K RAM, one disk drive, PC-DOS 1.1, color/graphics or monochrome adapter, monitor.

**CIRCLE 559 ON READER SERVICE CARD**

There's a fable ebout e talented inventor who wanted to develop the ultimate soft drink, an uncole. He called his first version "One-Up," his second try, "Two-Up"; and his third, "Three-Up." Each version was pretty good, but never caught on. "Enough is enough," he finally decided, and quit his work with "Six-Up."

The same situation occurs with *Flight Command* from Lighthouse Distributing. If there hed never been a *Flight Simulotor* from Microsoft, this program might have become a real winner. But good es it is, *Flight Command* pales in comparison to the newer product, which has gained a foothold on the upper echelons of software sales for the IBM PC.

When I took a few passes at flying lessons a number of yeers ago, there was one element of the course thet terrified me more than any other—flying "under the hood." In this advanced phase of instruction, a set of blinders was pleced on my head, ailowing me to see only the instruments; there was no wey to look out the window. I was forced to rely on the instruments to tell me the direction I was flying in, whether or not my wings were levei, my rate of climb or descent, and other important information. Some instructors have been known to turn the plane upside down es the "hood" is instelled to see if the student notices.

## Under The Hood

In effect, this is what *Flight Command* offers—e chance to fly "under the hood" with one of six eircraft: e Cessna 150, e common two-seater used for training and entry-level flying; a Pitts Special, e one-seeter ecrobet; a P-51 Mustang, a high-speed military propeller plane; an F-14 Tomcat, a contemporary military jet that can cruise at 1,564 mph; a Boeing 747 behemoth; and a Concorde SST speed champion cruising et 1,680 mph.

The dispiay for the F-14 Tomcat shows altitude, airspeed, course, fuel, pitch, roll, VHF Omnidirectionel Ranging (VOR); Distance Meesuring Equipment (DME); Instrument Landing System (ILS) displey; RPM for each engine, flaps, wing and skin temperetures, gear stetus, power rating, end elevetor, rudder, and aileron readings. Your plane's position and destination are also shown, displeyed as longitude and letitude coordinates.

You may choose one of 179 different destinetions, ranging from Adak Islend (between Alaska and the Soviet Union) to Los Angeles to Zanzibar, and many points along the way. Selection of a destination is completed during the course of "radio" communication with the control tower or with flight controllers along the way. As you move toward your destinetion, the instruments give your bearings.

A chart included with the game advises you of fuel capacity, crulsing speed, and range for each of the planes, as

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CIRCLE 301 ON READER SERVICE CARD


well as the cruising speed, altitude ceiling, end stall speed (the combinetion of decaying speed end engle of etteck et which the plene's wings lose their ability to meintain lift). The Cessne 150 has the shortest range, and is capeble of teking you nearly 400 miles if you menege your flight properly. The Boelng 747 end the Concorde beve the longest range. A three-color wall mep sbows the airports evailable to the plene you select.

***FLIGHT Command offers a chance to fly "under the hood."***

If all this sounds complex end chellenging, it is. Unlike its competition, however, *Flight Command* does not make much use of the edvanced graphics of the PC. All you see are the dlgital reedouts of most of the instruments (this informetion is supposed to be sufficient for any pilot with an instrument rating). Your rader displey is merely a schemetic. There is no "view" outside the window, one of the major "Gee, whiz" effects of *Flight Simulator*. There are no sound effects except for an occasional werning beep or e Klaxon (wbich signaled my constant crashes).

### Checkout Hassles

Part of the *Flight Command* fiction involves the maintenence of a set of books for each "pllot." When you boot up the game (under BASICA, using e color/grephics edepter and e monochrome or color monitor), you arrive et the "Aircraft Checkout Counter" where you are asked your name. If you've flown before under thet name, you'll then see e log book thet records the number of hours you've flown, your crasbes, your eernings, end the balence of your Americen Express eccount. I found this part of the program rather silly. What's more, I never menaged to accumulate any money in my earnings register, since each of my crashes wes cherged to the American Express card. I wonder if Karl Melden ever bed thet problem?

From the checkout counter, you proceed to the Flight Line, wbere an ettendent egein esks you for your neme, which seems unnecessary. Then, depending on the number of bours you've logged in the eir, you're offered e choice of planes. It is possible to evoid most of the checkout game by merely booting up the name of one of the plenes from within BASICA, using e commend such es RUN "747.BAS".

Your controls in midair include an eutopilot that keeps the plene level and on course, e help command, controls used to set fleps, eilerons, e rudder, an elevetor, and a throttle.

Unfortunetely, Lighthouse Distributing does not provide an instructor. The "manuel," if you can cell it that, is pitifully short end vague. There is no informetion on the theory of flying, no single gathering of ell of the controls, end not even a box-by-box explenetion of the various elements of the television monitor instrument panel. There was a two-page insert called "Hot Tips" included in the package I reviewed thet added some but not all of the necessary informetion.

I'm efraid that *Flight Command* elmost resembles one of those "Airport" disaster movies in which the pilot, copilot, engineer, end most of the crew and passengers have been struck down by poisoned airline food (a redundancy?), leaving only a little old ledy from Dubuque who has never been in a bus before, much less e jet aircraft, to fly the plene.

***UNLIKE ITS competition, however, Flight Command does not make much use of the advanced graphics of the PC.***

Of course, this is not the first computer program to be hobbled by the leck of decent instructions. However, be edvised thet you'll heve to solo your first time out.

Is *Flight Command* realistic? Not really. But then egein, neither is *Flight Simulator*. In both pieces of software, you're

still very aware that you are at a keyboard rather than a control panel. *Flight Simulator* is closer to an arcade game. Its exciting, though still sketchy, visuals are a real

***THIS IS NOT the first computer program to be hobbled by the lack of decent instructions.***

strongpoint. Its display of instruments is more impressive than those offered by *Flight Command* because you watch rotating gauges and artificial horizons rather than mere numbers.

By comparison, *Flight Command* looks more like a text adventure than a graphics game, although this is not necessarily bad. I found it slightly more challenging to "fly" *Flight Command*, but it was not as much fun as its popular competitor.

*Air Traffic Controller*
Avant-Garde Creations
P.O. Box 30160
Eugene, Oregon 97404
(503) 345-3043
**List Price:** $29.95
**Requires:** 64K, PC-DOS, color/graphics or monochrome adapter.

CIRCLE 558 ON READER SERVICE CARD

With all the 747s, Concordas, Cessnas, and military aircraft zooming around the sky at the hands of computer owners who hava trouble piloting the family Chevrolet through a shopping center parking lot, there is bound to be need for a good air traffic controller.

Well, like *Flight Command*, *Air Traffic Controller* from Avant-Garde Creations comes close, but it is no air champion. This adaptation of a popular Apple II game presents a small rectangle and a wind indicator on your screen. Numbers and symbols representing aircraft move around in the "sky." Your job is to keep the planes from colliding in midair, stack them up in a logical fashion for landing,


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CIRCLE 504 ON READER SERVICE CARD

keep an eye on fuel status, and bring them in to a neat, upwind landing.

The location of the plane is represented by something like 5 <, 1150, E, which means thet Plane 5 is on e level (<) course at 1,150 feet, heading east. If enother plane were moving straight at 6^, 1200,S, you would have no cause for alarm, since this means thet it is climbing and is elreedy at a higher altitude.

It's feirly simple to keep the various planes separeted; you communicate with the planes through simulated redio conversations. To tell Plane 8 to descend, for example, you would type 6D, and the arrow would change direction. The program essumes thet ell commands not preceded by e number refer to the plane last communicated with, a convenience when you're on finel epproach in e crosswind.

### Crash Landings

I was not too successful in performing landings, however. My planes seemed to consistently fall short or veer off the runway at the moment of touchdown. I was not helped by the IBM PC instructions for *Air Traffic Controller*, either. They consisted of e single printed pege inserted in the Apple II package—hardly adequate, even when supplemented by reading the Apple II instructions (which involve a different set of commands) or by reeding a few pages of on-screen instructions. Once egain, this is an interesting piece of programming that has been marred by e leck of concern for novice users.

*THIS IS AN interesting piece of programming that has been marred by a lack of concern for novice users.*

Furthermore, this program makes no use of the graphics and sound capabilities of the PC. At the very least, the program could heve presented a circular radar screen with e sweep arm. At most, it could have been a worthy companion to *Flight Simulotor*. Instead, it's an interesting relic of early computer games that have come creaking onto the IBM PC screen.

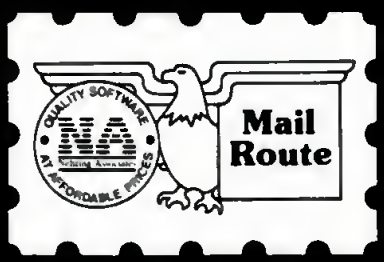
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The next game involves military aircraft; in this case, something celled an "ultra-


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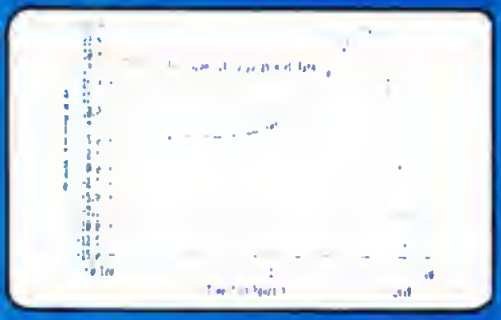
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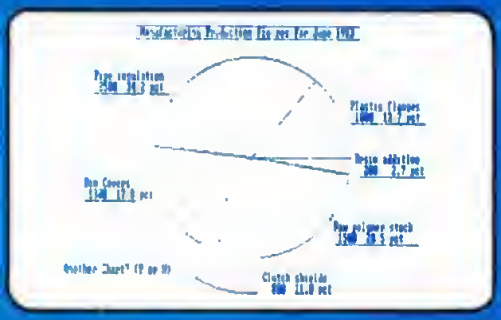
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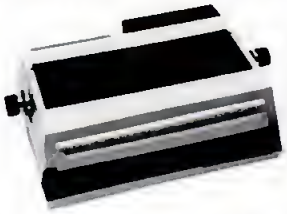
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light," which is "half push-prop airplane, half hanglider" and is equipped with both a radar screen end of course the obligetory laser gun.

Your mission, should you decide to accept it, is to participete in e strenge melenge of good guys and bad guys. Your ettackers ere unidentified enemies in helicopters, jet planes, elien pods, and flying saucers. The beneficieries of your defense are two little men in e tiny open motorboet. Cleerly, ours is not to question why.

Besically, *Ultralight Command* is yet another shoot-em-up, reminiscent of the highly popular Apple II game *Choplifter* in its display and shooting tactics, with the inclusion of "ectual voice transmissions" from mission control.

You are given the choice of running the game from either the keyboard or from e joystick, and you mey select from three levels of difficulty. The keyboard commands, which may be reset, use the cursor keys. There is no pause during the course of the game, however. At the start, you are queried about your monitor: RGB color, color or monochrome television, or monitor wired to the PC color/graphics edepter. The progrem is elso copy-protected.

## Not Much Action

The ection of the game involves moving the "ultralight" back end forth and up and down on the screen, firing the laser when one of the unusuel assortment of enemy craft is within range. One interesting effect involves a peir of radar screens at the bottom of the display, one shows the oncoming traffic aheed of you, the other shows the traffic behind you. The progrem gives you e werning beep whenever e target appears.

*BASICALLY, Ultralight Command is yet another shoot-em-up, reminiscent of the highly popular Apple II game Choplifter.*

The pley action was quite ordinary; it was possible to fly elong peaceebly by either staying up et the top of the screen (perheps the aliens are afraid of heights?) or by reversing the direction of the flight, which usually puts your enemies into reverse flight.

And then there is the matter of the voice transmissions that emit from the PC's built-in speaker from time to time; it took a while to figure out thet the announcements were elong the lines of "Attack Weve Four!" Instead, they sounded more like the elmost totally unintelligible squewks of e loudspeaker on e crowded New York City subwey et rush hour.

Nice try, Fast-N-Fun Video. I'd give this geme some credit for innovetion, even if it is the third member of our trilogy of flying games to meander off course efter a promising takeoff. */PC*


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by

**PETER NORTON**

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SIGHT AND SOUND/JOHN M. WORAM

*Recording engineers have traditionally relied on intuition or trial-and-error to select and position microphones in the studio. Programs for the PC can make a science of this.*

# "Testing 1 2 3" With The PC

Not too many years ago, the recording industry was a reasonably safe hideout for those technical types whose inclinations were more sonic than scientific. In fact, the Engineer part of the title, "Recording Engineer," rarely had anything to do with university credentials. Most of us got our education hanging around the studio—and just as well, too. Most university engineering programs had not yet conceded that there might be intelligence existing below 20,000 Hz (or, at the time, cycles-per-second).

Needless to say, all of this has changed drastically, and it's no longer enough for



Microphone photographs courtesy of Shure Electronic Corp., Harvey Professional Audio/Video Division, and Sennheizer Electronic Corporation.

the recording engineer to boast a good ear and a pleasing manner. It all began when stereo replaced mono recording. This was followed in short order by recording on three, four, and eight tracks, and now the 32 or more separate channels of multi-track tape recorders.

As high technology found its way into the studio, the recording engineer's little book of jargon soon gave way to a full-size lexicon with entries such as "over-dubbing," "synchronization," "interfecing," "interlocking." The old-timers got very uncomforteble indeed. In no time et all, a big-buck multi-track audio/video recording production got to be more than one person could comfortably handle. It felt a hit like trying to fly a 747 with a single-engine license.



In little more than no time et all, computers started showing up in the recording studio to help keep things menegeeble. The engineer, who had been comfortahle enough doing musical balancing acts with the familiar slide faders, now hed to contend with keyboards and CRT displeys, and in some cases, even color graphics!

The Industry has more or less come to terms with the new technology, and some of us are even getting comfortahle with e new group of words beginning with "micro." As the once-fearsome computer becomes more end more femillar, some recording engineers have begun exploring its use in applications thet go beyond just running the equipment.

For exemple, consider the fine art of microphone placement. There are no rules here, and there probebly never will be. The proper microphone correctly placed is based on nothing more than what works best under the circumstances of the moment. In any recording session, different circumstances will suggest different microphones. Still, when it comes to microphone placement, it often helps to know "what heppens if ..."—not e question for SuperColc.

*THE PROPER microphone correctly placed is based on nothing more than what works best under the circumstances of the moment.*

Specifically, you must teke into eccount thet each microphone has its own characteristics. Its frequency response helps the engineer decide which microphone to use on which instrument. On e multi-track production, super-flat response is rarely preferred. Rather, the engineer seeks a microphone with e "personality" that compliments each musical instrument. An important part of thet personality is the microphone's polar response; that is, its sensitivity to sounds arriving from various directions.

More often than not, each instrument being recorded is directly in front of its own microphone, with other instruments located some distance away. This gives the engineer more control over the musical balance. (Discussion of the artistic merit of this technique is fortunately beyond the scope of this little opus.)

In the quest for more end more acoustic isolation between instruments, engineers may seek out a highly-directional microphone—one that fevors sounds arriving from directly in front of it (thet is, on-axis) and which greatly attenuates sounds erriving from elsewhere (off-axis). Of course, attenuation is mostly a matter of degree (literelly, in terms we shall soon see), so there is really no such thing as a microphone which is totally unresponsive to off-axis sound.


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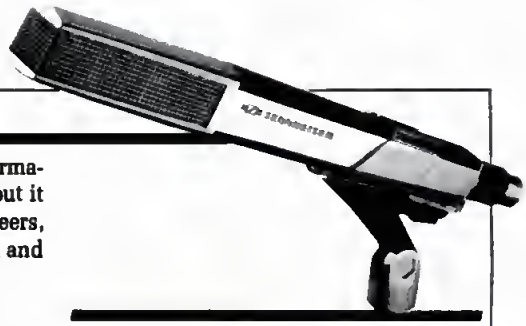
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To further complicate metters, when the outputs of any two (or more) microphones are combined, their individual polar responses interact. Under certain conditions, two highly-directional microphones mey in effect become one microphone which is not directional et all. Under the worst of conditions, e recording of an on-the-street interview may wind up with more street than interview.

To help the engineer seiect the right microphone, specification sheets generally include a graph of polar response, Figure 1. The three examples in Figure 1 illustrate ideal bi-, uni-, and nondirectional responses, and in eech case the microphone's ettenuetion at any angle may be read directly from the greph.

***WHEN IT comes to microphone placement, it often helps to know "what happens if . . ."***

Tbe directional sensitivity of these microphones, or eny others, mey be piotted using the general polar equetion, S = A + Bcos$\Theta$. *A* is the measure of nondirectional sensitivity; *B* is the measure of directional sensitivity; and $\Theta$ is the angle from which sound arrives. This information mey fascinete mathemeticians, but it doesn't interest most recording engineers, who prefer to get on with the session and never mind the number-crunching.

**Meanwhile, What If . . . ?**

However, some questions do come up. Whet if the signals from two uni-directional microphones are combined? What if the polarity of one of these microphones is reversed? Since bi-directional microphones are not commonly found in many studios, is it possihle to create one in e pinch by combining two uni's? Given two microphones with totally different polar characteristics, is it practical—or even possible—to make a really satisfactory stereo recording?

For most working recording engineers, the answer to this kind of questioning is quite often something like, ". . . well, uh . . ." However, e little intuitive knowledge about whet wiii happen when two microphone outputs are combined could go e long way toward helping any recordist with microphone selection and placement. Unfortunately, mathemetical and/or graphical enelysis of polar petterns is not nearly as much fun as recording, although it can certainly be as time-consuming.

**Enter the PC**

Here's an eesy job for the PC. With e little bit of BASIC, it's possihle to find out just whet wiii bappen when any two microphone outputs are combined. After trying out just e few combinations, many engineers (ameteur es weii es pro) may find that their recording technique has improved greatly.

***THE ENGINEER seeks a microphone with a "personality" that compliments each musical instrument.***

But first, back to thet equetion, S = A + Bcos$\Theta$, and a few basic (iower case) ruies of the road. A + B is alweys equel to 1, and $\Theta$ indicates the angle of the sound source. Since cos0 = 1, when the sound arrives from straight aheed, for any microphone, it's true that S = A + B(1) = 1, regardless of its sensitivity. In other words, we assume that all microphones are equally sensitive to sounds arriving on-axis. If the overaii system gain is turned up or down, the sensitivity changes eccordingly.

Going e step further, the specific velues for A and B give an indication of the microphone's directional sensitivity. The

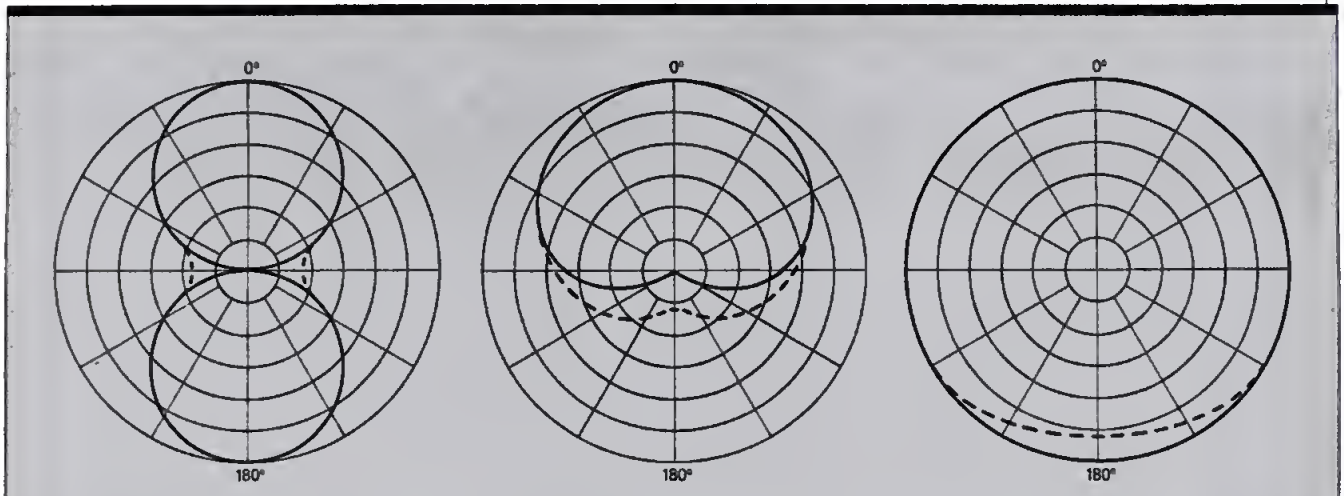



*Figure 1: Examples of three typicol microphone polar respanse potterns: bi-directianal (left), uni-directional (middle), and non-directianal (right). The microphanes face taword 0 degrees at the top of the diagrams. The salid lines indicate the ideal patterns, while the dashed lines represent octual values of some typicol commercially-avoilable microphones.*

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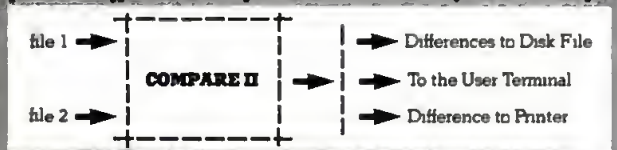
```
240 PRINT "Calculating polar patterns"
250   FOR N = 1 TO 2
260     FOR K = 0 TO 72
270           R = .01745 * (5 * K - AN(N))
280       R(N,K) = SN(N) * (A(N) + B(N) * COS(R))
290        TH(K) = 8.724999E-02 * K
300       X(N,K) = ABS(R(N,K)) * COS(TH(K))
310       Y(N,K) = ABS(R(N,K)) * SIN(TH(K))
320       PRINT "#";
330     NEXT K
340   NEXT N
350 PRINT
360 PRINT "Calculating the SUM pattern"
370   FOR K = 0 TO 72
380     PRINT " + ";
390         FS = R(1,K) + R(2,K)
400     X(3,K) = ABS(FS) * COS(TH(K))
410     Y(3,K) = ABS(FS) * SIN(TH(K))
420   NEXT K
430 PRINT
440 PRINT "Calculating the DIFFERENCE pattern"
450   FOR K = 0 TO 72
460     PRINT " - ";
470         FD = R(1,K) - R(2,K)
480     X(4,K) = ABS(FD) * COS(TH(K))
490     Y(4,K) = ABS(FD) * SIN(TH(K))
500   NEXT K
```

*Figure 2: This BASIC subroutine will colculote the X ond Y coordinates for twa microphones' polor patterns, ond their sum ond difference. You must first enter the volues for A (non-directionol sensitivity), B (directionol sensitivity), ond AN (the angle at which each af the twa microphones is oriented).*


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# *THE DIRECTIONAL sensitivity of microphones may be plotted using the general polar equation, $S = A + B\cos\Theta$.*

greater the value of B, the more sensitive the microphone is to the direction from which the sound is arriving. When B = 0, then BcosΘ will always be zero, regardless of the value of Θ. In other words, the angle of the arriving sound is of no significance, and the microphone's sensitivity is always equal to 1. The microphone is truly nondirectional. When B = 1, sensitivity is strictly dependent on the angle Θ, and the polar response is bi-directional. When values are midway between these extremes (A = 0.5, B = 0.5) the microphone's response is uni-directional.

Now then, what happens when any two microphone outputs are combined? For the moment, let's assume the microphones are placed back-to-back, so that a sound arriving at the front of one (0 degrees) simultaneously reaches the rear of the other one (180 degrees). For that matter, a sound arriving at microphone 1 from any angle Θ arrives at microphone 2 at an angle of Θ + 180. The equations may be added as follows:

Microphone 1 + Microphone 2
[A + Bcos (Θ)] + [A + Bcos (Θ + 180)]
Sum = 2A + B − B = 2A

In other words, the values for A and B don't really matter; when the microphones are combined, the cosine term drops out and we are left with a nondirectional polar response. So we may conclude that combining any two identical microphones back to back will always give us an omni-directional pattern.

On the other hand, if one of those

microphones hes its polarity reversed, we must subtract the outputs, and get:

Microphone 1 − Microphone 2
[A + Bcos (Θ)] − [A + Bcos (Θ + 180)]
Difference = 2Bcos(Θ)

The plot thickens. As the angle between the microphones is varied, the cosine term does not entirely drop out during addition, and so the combined pettern coLtains some amount of directionality. But when there is a polarity reversel, the A term alweys drops out, so thet combination is always bi-directional.

Once this point is clear, the engineer wiii realize that a bi-directionei microphone can be quickly whipped up, just by combing any two uni-directional microphones and setting up one of them with a polarity reversal. Without the polarity reversal, the same two microphones would deliver a nondirectional response; this would explein the sudden diseppeerance of either microphone's highly-directional characteristic.

### Stereo Recording

A well-proven stereo recording tecbnique is to use one uni-directional microphone and a bi-directional microphone, with the letter oriented at 90 degrees to the sound source. When tbe outputs are combined, the result is a signal favoring the left side of the sound source. When the same outputs are combined, but with e polarity reversel in the bi-directional output, the result is a right-oriented signal. With one of these combinations feeding the ieft speeker, and the other going to the right, we bear an excellent stereo rendition of the original sound source. As the bi-dlrectional output is varied from off to on, the reproduced output varies from mono to very-wide-engle stereo.

The methematics to prove this can get a bit tedious, so it's best to turn the tesk over to the PC. A reasonabiy simple program will hendle the chore nicely.

```
520   FOR N = 1 TO 4
530      FOR K = 0 TO 72
540         XX(K) = 160 + SC * 108 *(K(N,K))
550      IF ABS(K(N,K)) > HS THEN eS = AeS(X(N,K))
560         YY(K) = 100 - SC * 100 *(Y(N,K))
570      IF AeS(Y(N,K)) > VS THEN VS = AeS(Y(N,K))
580      IF K = 0 THEN GOTO 610
590      IF N = 4 THEN PSET(XX(K), YY(K)):GOTO 610
600      LINE (KK(K), YY(K)) - (KK(K-1),YY(K-1)), N
610      NEXT K
620   NEKT N
```

*Figure 3: A subrautine to draw the four polar response potterns on o medium-resolution disploy, using the volues colculated by the program in Figure 2.*

### Microphones Meet The Micros

Figure 2 presents e short BASiC subroutine thet will calculete the X and Y coordinates of any two microphone polar patterns, end then calculete the coordinates for the sum and difference petterns. The FOR N = 1 TO 2 loop permits e set of calculetions for two patterns. For each set, the K loop steps the calculetions througb 72 increments, of 5 degrees each.

In line 270, AN(N) is the angle at which the microphone ls oriented, and R is the lncremented angle, expressed ln radiens.

Line 280 calculetes the sensitivity R(N,K) of eecb microphone et each 5-degree increment. SN(N) is the on-axis sensitivity of the microphone. For the moment this can be set equal to 1 for both microphones. Next, the X end Y coordinates are calculeted by multiplying the absolute sensitivity by the cosine and sine of the angle.

The PRINT "#" statement in line 320 could be chenged to displey the X and Y coordinates as they are being calculeted. Since these calculations eren't very interesting to wetch, the # symbols thet eppear simply show you the program is running.

The loop to calculate the sum pettern, beginning on line 370, does much the seme routine, except that the sensitivities of both microphones R(1,K) and R(2,K) ere added in line 390, end the sum coordinetes X(3,K) and Y(3,K) are calculeted.

Finelly, the loop beginning on line 450 does the seme thing for the difference coordinetes. In both these loops, the PRINT " + " and PRINT " − " just let you know the program is opereting.

### Drawing the Conclusions

Figure 3 presents the BASiC instructions thet will drew the polar responses for the two microphones es well as the sum end difference responses.

Since the center of the medium-resolution screen is at 160, 100, these values are combined with each X and Y coordinete in lines 540 and 560. And in order to draw a suitably-proportioned displey, eech coordinete is muitiplied by e scaling factor of 1 end then by 100. Actuelly, the X coordinate may be multiplied by about 110, in order to drew a better-proportioned circle. A little triel-end-error mey be required,

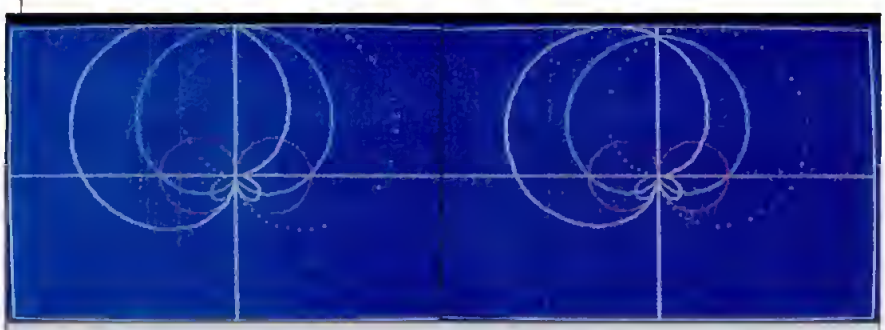


*Figure 4: A display illustrating polor response potterns for the Mid-Side (M-S) recording technique. The outputs of o uni-directionol (blue) ond a bi-directionol (red) micraphone can be combined to yield the sum (solid white) ond difference (dotted white) potterns. The disploy on the right hos been rescoled to fit within the screen's boundory.*



```
2020    FOR X = 1 TO 2
2030      SA(X) = A(X) * SN(X)
2040      SB(X) = B(X) * SN(X)
2050    NEXT X
2060  D = AN(1) - AN(2)
2070 DD = 1.745329E-02 * D
2080 CLS
2090 PRINT "When the following two microphones;"
2100 PRINT
2110 PRINT "[Blue pattern] M1 = ";USING "#.###";SA(1);
2120 PRINT " + ";USING "#.###";SB(1);
2130 PRINT "cos";CHR$(237);MID$(G$(1),22,35);
2140 PRINT ",and"
2150 PRINT "[ Red pattern) M2 = ";USING "#.###";SA(2);
2160 PRINT " + ";USING "#.###";SB(2);
2170 PRINT "cos";CHR$(237);MID$(G$(2),22,35)
2180 PRINT
2190 PRINT "are combined, at an angle of"
2200 PRINT
2210 PRINT TAB(10) D;" degrees, the results are;"
2220 PRINT " - - - - - - - - - - - - - - - - - - - - - - - - - - - - -"
2230 S$ = "[Solid line      =      SUM:]"
2240   FOR X = 1 TO 2
2250     PRINT S$
2260     PRINT
2270     IF SB(1) = 0 OR SB(2) = 0 THEN DEN = 1:GOTO 2290
2280     DEN = SB(1)/SB(2)
2290      RA = ATN(SIN(DD)/DEN)
2300       A = SA(I) + SA(2)
2310       B = SB(1) * COS(RA) + SB(2) * COS(-DD + RA)
2320       C = ABS(A) + ABS(B)
2330      RC = 1 / C
2340     PRINT " Polar equation = ";
2350     PRINT TAB(20) USING "##.###";A;
2360     PRINT " + ";  USING "##.###";B;
2370     PRINT "cos";CHR$(237)
2380     PRINT " Normalized eq. = ";
2390      AN = A * RC
2400      BN = B * RC
2410     PRINT TAB(20) USING "##.###";AN;
2420     PRINT " + ";  USING "##.###";BN;
2430     PRINT "cos";CHR$(237)
2440     PRINT "Resultant angle = ";
2450      DG = RA/1.745329E-02
2460     PRINT TAB(20) INT(DG * 100 + .5)/100;" degrees."
2470      IF A < 0 OR B < 0 THEN PRINT " - - (note polarity reversal) - - "
2480      S$ = "[Dotted  line = DIFFERENCE]"
2490   SA(2) = -SA(2)
2500   SB(2) = -SB(2)
2510     PRINT
2520  NEXT X
```

*Figure 5: A BASIC subroutine to calculate the sum and difference patterns for two microphones that displays the results numerically.*

since the optimum value will depend on the screen being used. You can experiment by drawing a bi-directional pattern and adjusting the scaling factor to your screen size.

### Scaling the Display

Depending on the values chosen for A and B, the sensitivities of the microphones, and the angle between them, the sum and/or difference displays may go off-screen. A new scaling factor (SC) can be calculated as a correction, if this happens, by the following lines:

*GIVEN TWO microphones with totally different polar characteristics, is it possible to make a really satisfactory stereo recording?*

```
HS = 1/HS : VS = 1/VS
SC = HS
IF VS < HS THEN SC = VS
```

The scaling factor is based on values for the horizontal and vertical scales (HS and VS) which had been continuously up-


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```
When the following two microphones;

M1 = .376 + .625 cosØ (blue pattern), and
M2 = .376 + .625 cosØ (red pattern)

are combined, at an angle of

    90 degrees, the results are;
-----------------------------------
  SUM: (solid line)
Polar equation = 0.750 + 0.884cosØ
Normalized eq. = 0.469 + 0.541cosØ
Resultant angle = 46 degrees.

DIFFERENCE: (dotted line)

Polar equation = 0.000 + 0.884cosØ
Normalized eq. = 0.000 + 1.000cosØ
Resultant angle = -45 degrees.
```

*Figure 6: A display summarizing the calculations performed by the subroutine in Figure 5.*

dated in Lines 550 and 570. If the display is to be redrawn, this SC value is substituted for the previous value of SC = 1 in Lines 540 and 560.

Figure 4 illustrates the Mid-Side (M-S) microphone combination. The blue pattern is the uni-directional microphone at 0 degrees, and the red pattern shows the bi-directional pattern at 90 degrees. Sum and difference patterns are shown by the solid- and dotted-line curves. Since the top of the display is slightly off-screen, the display may be rescaled and redrawn, as seen in the second illustration of Figure 4.

### Just the Math, Please

If color graphics capabilities are not available, Figure 5 lists a program segment that will simply calculate the resultant sum and difference polar patterns when any two microphones are combined. In lines 2110-2120 and 2150-2160, SA and SB are the values of A and B multiplied by the microphone's sensitivity.

Depending on the sensitivities chosen, the actual microphone selected, and the angle between them, the sum of A + B in each of the resultant polar patterns will probably not be equal to 1. Therefore, Lines 2270 to 2420 convert these values to a normalized (i.e., A + B = 1) equation, making it easier—in the absence of a graphic display—to visualize the approximate shape of the resultant patterns. Again, remember that the greater the value of B, the more sensitive the pattern is to directional information.

### Entering the Data

A simple FOR N = 1 TO 2 loop can be written to enter values for the parameters of each microphone. First enter A(N), and then calculate B(N) = 1 − A(N). To keep things simple (at first), each microphone's sensitivity, SN(N) can be set equal to 1. As for the angle AN(N), 0 degrees is considered as pointing straight ahead, and the orientation rotates counter-clockwise as the angle is increased.

Most microphone specification sheets illustrate 0 degrees as pointing straight up, a practice that's followed in the polar patterns of Figure 1. However, mathematicians (and computers) usually draw 0 degrees as a horizontal line moving from left to right. Therefore, to make the graphics display agree with standard microphone diagram practice, add this program line: AN(N) = AN(N) + 90. This will get the 0-degree polar pattern pointing in the right (oops, that should be up) direction.

Once the calculations are done, and the displays have been drawn in the proper scale, the results are summarized on the black and white screen, as in Figure 6.

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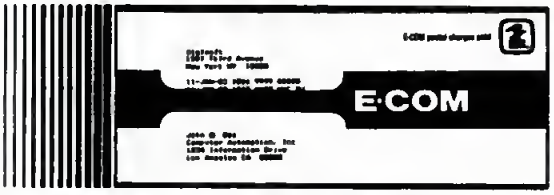
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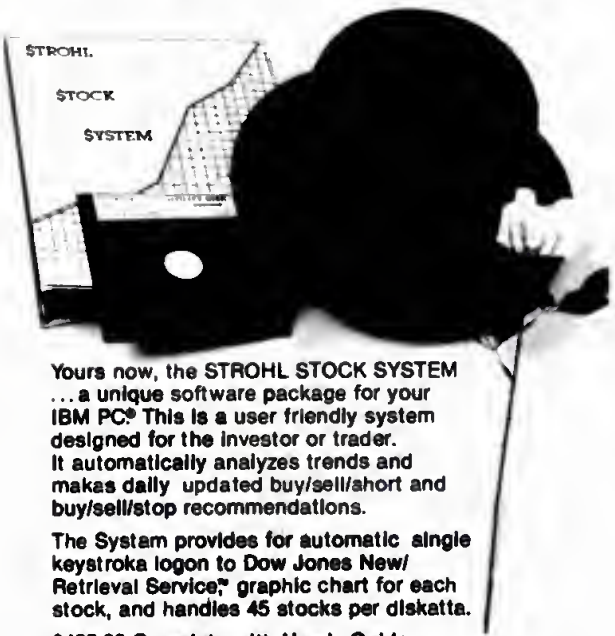
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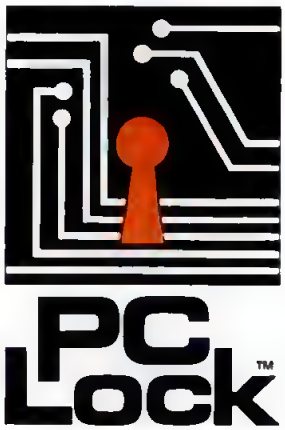
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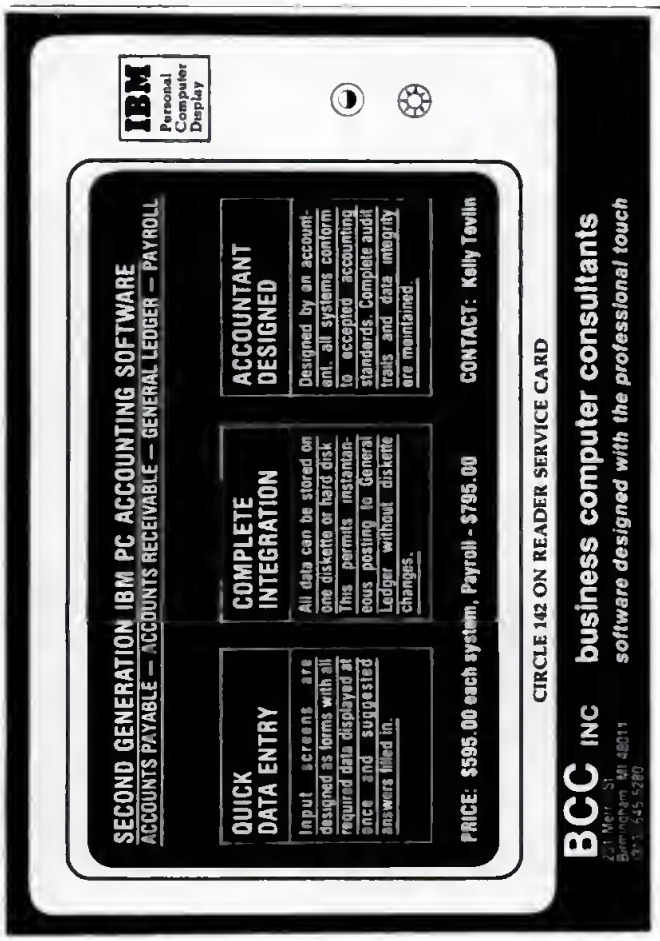
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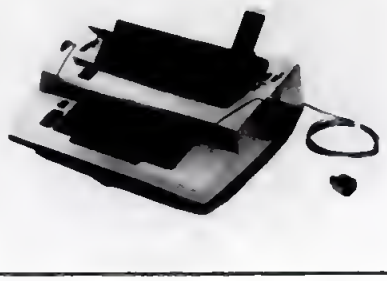
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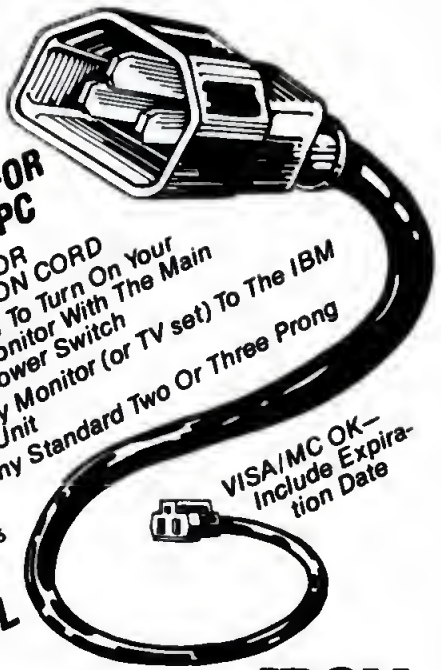
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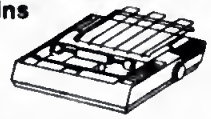
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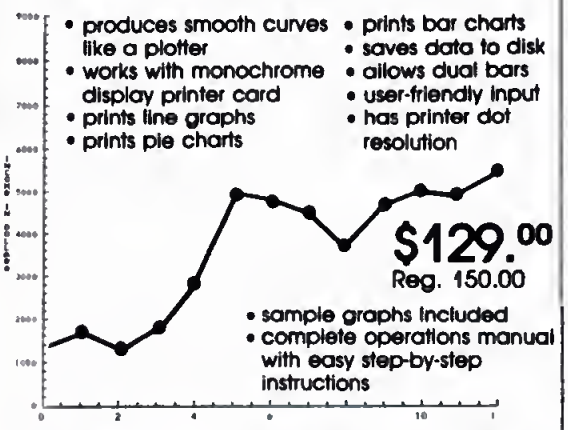
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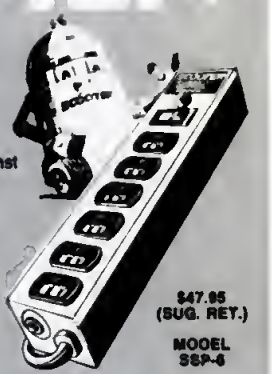
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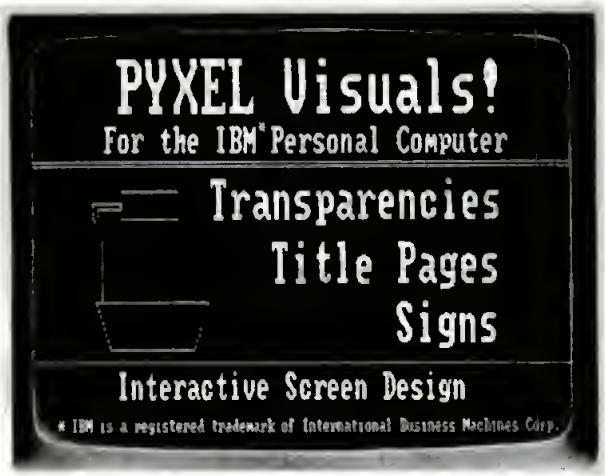
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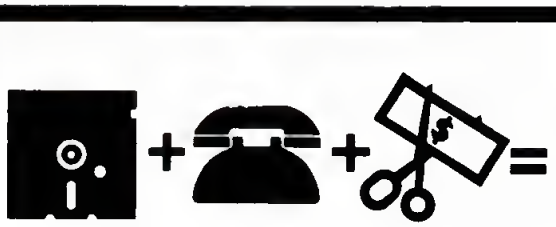
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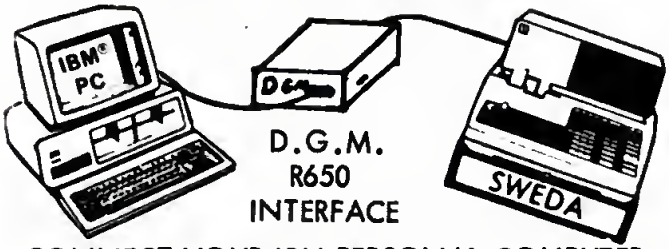


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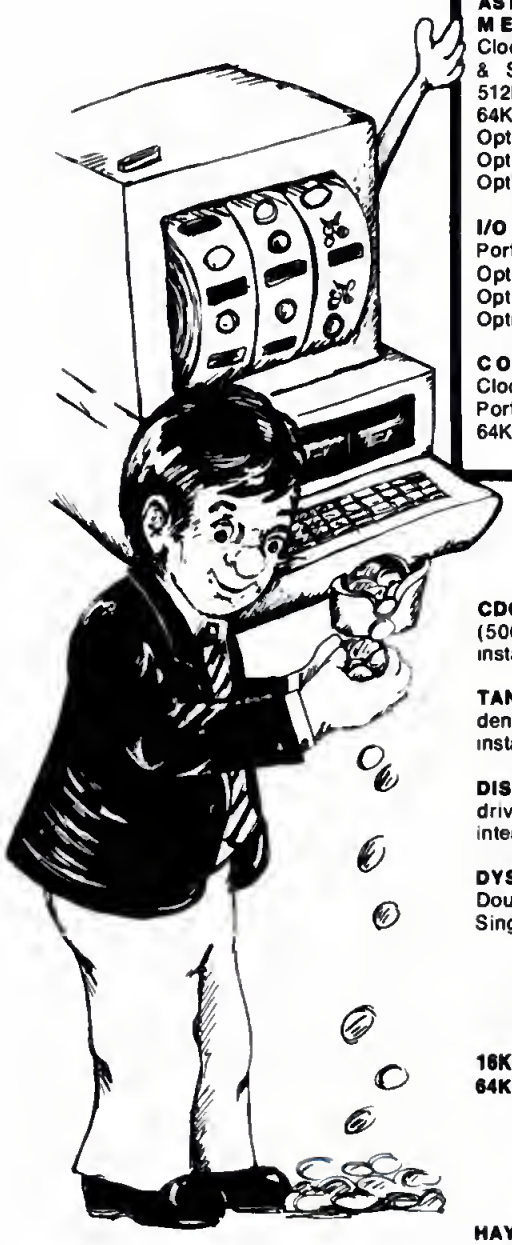
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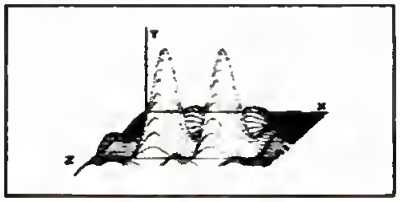
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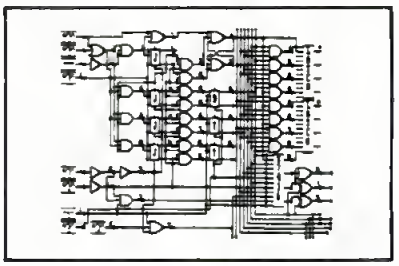
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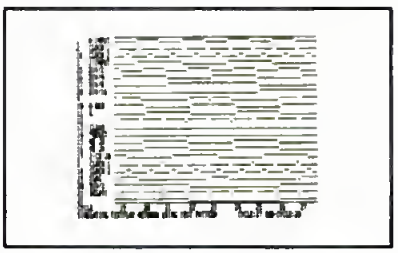
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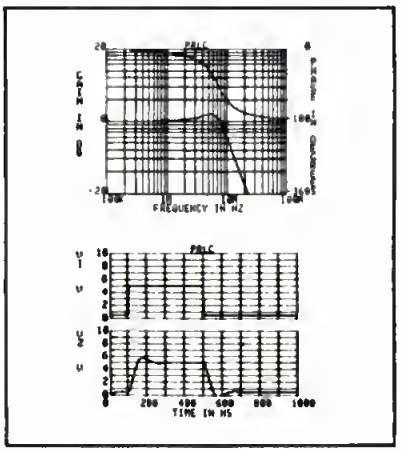
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*Despite troubled economic conditions, more and more farmers are investing their seed money in computers. PC's are being cultivated by farmers to become a better money management tool.*

# Computing Down On The Farm

If the computer industry believed the bleak predictions for farming in the next few years, the agricultural computer business would be abandoned as quickly as an outdoor lemonada stand in the middle of a blizzard. But this hasn't happened. Manufecturers that deal in farm related products are selling more lemonade than ever, so to speak.

What gives a market that looks so weak its hidden strength? Two things. First, numbers; second, attitudes. There are a lot of farmers, and in the United States, farmers are innovators. They are students of efficiency, in short, an interested and receptive market. The same economic conditions that make farming difficult make the computer more attractive.

Look at the numbers. *Agricultural Computing: the Doane Western Newsletter for Computer Users in Agriculture*, reported in December 1982 the results of a recent survey by the University of Illinois. 3 percent of all farmars currently own computers. Within 6 years, the survey suggests the U.S. [farm] market may be upwards of 60,000 computers. Specielists with the Illinois Farm Bureau estimate that the market within that state alona may exceed $140 million during the next few years. That's more than was spent on trucks by Illinois farmers in 1980.

In the Yakima Valley and the Columbia Basin of the stete of Washington, almost every dealar from Yakima to Wenatchee is gearing up to support the farm market.

One indication of the potential of tha farm computer market comes from IBM. It has enlisted Valmont, the laading manufacturer of center pivot irrigation sprinklers to distributa the IBM PC to tha farm markat. Radio Shack, anothar of tha top three companies in farm computing, is supporting the farm information network, Agristar, and plans to publish a sourcebook devoted exclusively to agricultural software. Apple also recognizes the potential of the market and is providing full corporate support. When it comes to market analysis, tha "big three" have looked carefully at the digital potential of the agribusiness; they saw that bushels and ecres can translate into megabucks.

As for the depressed economics of farming, it is useful to look closely at who is hurting and why. Low commodity prices, high production costs, and steep interest retes have affected many farmars. The older, larger farms, however, ara halped by tha equity they have built up over the years in buildings, land, and equipment. Even though the highly publicized foreclosures seem very foreboding, most of the farms will still receive their production and operating loans. But along with the dollars come admonishments from the PCA and from bank loan officers that farmers must manage their records better and keep a closer watch on their budgets. in short, Old MacDonald had better updete his management strategy.

### The Digital Farmhand

Computers and farm accounting and recordkeeping software are the tools that most farmers choose over so-callad "practical" equipment. When better management informetion is the top priority on the farm, a computer system often wins out over a bigger four wheel drive tractor or a new wind machine as the next major investment in the five-year plan.

Computar systems are cost justifiad on even the smallest farms because they can be used for recreation and aducation as well as for tha farm operation. Over the years, I have learnad to make very few generalizations about people—especially farmers—but I will risk two. One, farmers like to fiddla with gadgets, and mechanical things, and two, education is a high priority for farm families. This explains why the computer is a very attractive item

for a farm household's budget.

### Grading the Farm Computers

Which computers ere the local fermers now using in your area? What type of software fits your aree's egricultural operations? Time spent telking to other farm computer users and county extension agants means setisfection leter. Tba rula that software develapment foiiows hardwara sales holds true in tha ferm merket as well es in eny other. Since IBM, Apple, and Radio Sheck are wey out in front in terms of sales, obviously, far more agriculture software is meda evaileble for their products than for eny others. The next sales group lncludes North Star, DEC, Xerox 820, end Altos computers. Further down on the farm seles charts are Hewlett Packard, Vector Graphics, and Commodore. Of course, surprising things can happen, but it will probebly be e while before this lineup shows eny major chenges in tba farm computer merket.

Where should the farmer sbop for computers? The most critical variebles efter finding a salection of suitabla software ara hardware service and softwere support. On-site service end replacement equipment must be aveileble. With these considerations in mind, you cen determine how much distance shouid be batween you and the computer deeler. A 50-mile radius, or one hour's driving time, is probabiy reelistic for efficient hardware and software support. In more rural arees whare shopping is normelly a two-hour excursion, you can stretch the recommanded distence, but past a certain point driving is no longer cost effective; the oil price wer mey not last forever.

*BEFORE YOU purchase a computer you must determine what you really need it for.*

### Fields for the Farm Computer

Before you purchase e computer you must determine whet you really need it for: recordkeeping, farm eccounting, break even enelysis, leest cost retioning, deprecietion schedules, piecework peyroll problems, or herd records. You sbould also get ecqueinted with the farm information networks eveilable to you, such as Agnet, Agristar, end Compuserve. Wben you evaluate e computar purchase, decide if you went a system that can perform market enalysis or temperature monitoring, or a systam that can analyza paymant in kind progrems. Are you interested in crop audits, cost eccounting, farm equipmant inventories and repeir logs, commodity cherting, field records, or harbicida selection? Thasa are not just farm problems, they are also opportunities to use the computer to meet your real needs. You should understand these computer applicatlons, or bire a consultant wbo does, in ordar to make tha best possible choice of a computar system and the programs it runs.

Sinca eacb farming region is different from tha naxt, you should be eware that e computer progrem designed for farms in the Midwest mey not work for your area. Leern to distinguish your area's deta processing probiams. Is it iabor intensiva? Is lt multiple crop oriented? Do you need enterprise accounting or will e simple singla-entry check writing program do the job? This knowledge will halp you select tha appropriata software, which may halp detarmina the hardware you will buy.

Farm software is becoming plentiful, but quality and local relevence still need to be evalueted carefully. Some of the better farm eccounting packages include the Secretory of Agriculoture, Agricultural Finonce, the Homesteod Form Accounting Program, end the Finonciol Monogement Accounting System.

### Meeting the Rural Payroll

Finding a farm payroii program for lebor intensive stetes such es Celifornie, Florida, end Washington is still a problem. You should find e local source thet bas daalt with the idiosyncresies of your stata's laws. We lookad long and hard to find a payroll program to use in Washington state. We needed a package thet hendled piecework end hourly wege combinations as well as the edvances end deductions that ere often necassary for fieid iaborers. Aithough wa found a progrem, it wes not customized, so we mede use of a local programming resource.

The key to a successful ferm system purchese is matching relevent software end reesonable hardwere costs to needs and eveileble resources. Tenecity and trust are also critical. The daclsion to buy—and even the courage to buy—mey take a while to come, but with proper support the risk is minimel.

### Sizing Up Farm Computers

How does the farm computar markat size up? Three mejor groups, eccounting for most potantial on-farm computer buyers, can be categorized eccording to size and need. The top critarie for computar system selection are the number of checks written, the number of W2 forms filed at the end of the year, end the number of cost accounting enterprises to be kept track of. These ere not hard and fast criteria, but they will give you an idea of the computer systems ball park.

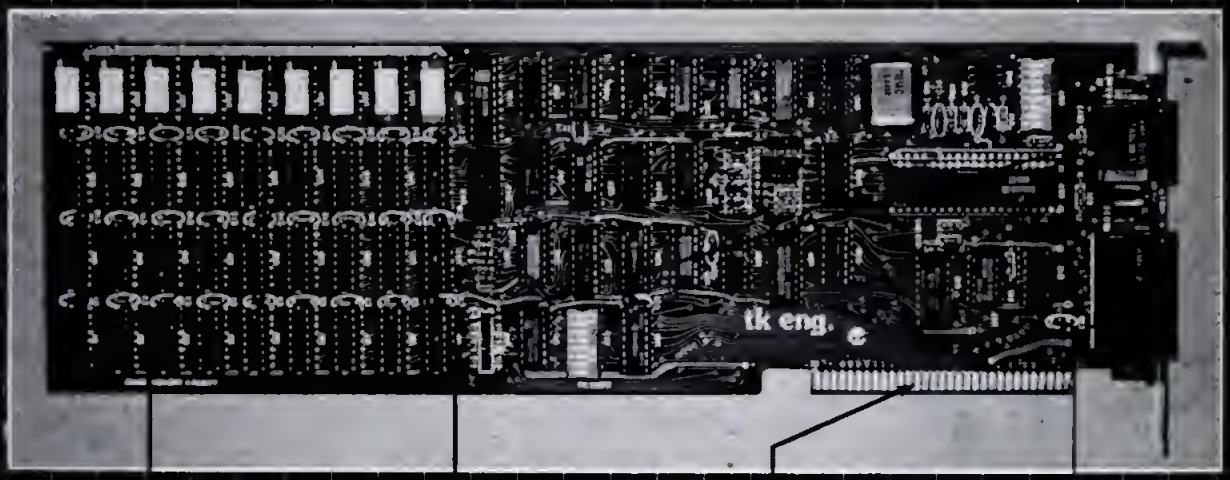
*A COMPUTER program designed for farms in the Midwest may not work for your area.*

Small farms are charecterized by the following criteria: they write under 500 checks a year, an averege of two transactions par check, ten or fewar W2 forms et the end of the year, end no more than three cost eccounting entarprises. Small farms can often be accommodatad by a $3,500 to $4,000 computer systam with an edditionel $500 to $1,000 invested in software. A single-entry check writing program is often adequate.

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10-megabyte hard disk may be a wise move either now or in the future. If spreadsheets are an important element, using a minimum of 128K RAM may be worthwhile.

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CIRCLE 561 ON READER SERVICE CARO

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McComb, MS 39648
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**Requires:** 64k, two disk drives, monochrome display.

CIRCLE 560 ON READER SERVICE CARD

***THE TOP criteria for computer system selection are the number of checks written, W2 forms filed at the end of the year, and cost accounting enterprises.***

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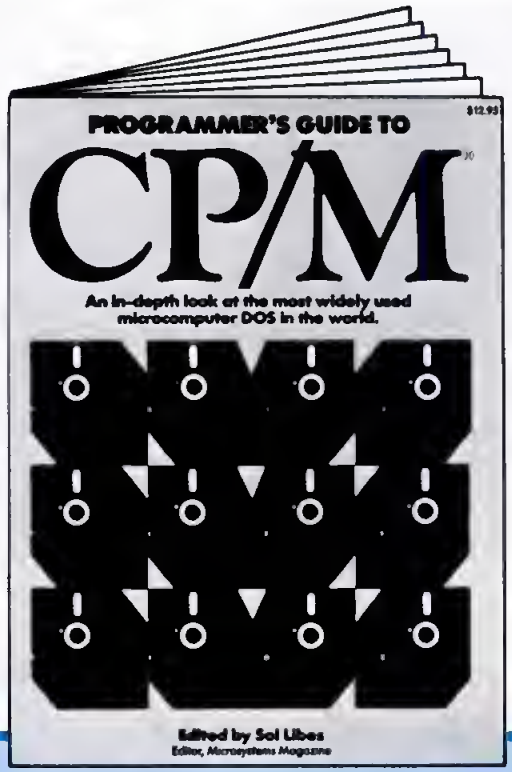
To repeat the basics: if you wish to make a wise on-farm computer purchase, a front end investment in time and research is necessary and advice from your accountant is helpful. The accounting and bookkeeping capabilities that your computer will provide can help keep your farm out of financial trouble, and that's certainly well worth the effort. */PC*

*Dick and Jan Landis are employed by Agrimonogement, Inc. os computer consultonts in Yokimo, Woshington. They hove written feature articles for computer periodicols ond o monthly column which oppeors in numerous ogricultural ond regionol publications.*

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CIRCLE 149 ON READER SERVICE CARD

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*Perfect Calc puts out a spread of tasty features that may tempt users to bite off more data than this program can swallow.*

# Perfect Calc: Linked Spreadsheets With Flexible Formats

*Perfect Calc*
Perfect Software, Inc.
702 Harrison St.
Berkeley, CA 94709
1-800-222-4222
**List Price:** $295
**Requires:** 64K, one disk drive.

CIRCLE 631 ON READER SERVICE CARD

The profits from *VisiCalc*, one of the all-time best-selling programs for microcomputers, have made Visicorp, the publisher, a major force in the microcomputer world. This has not escaped the notice of other software manufacturers. They, not surprisingly, are eager for a share of the vast electronic spreadsheet market.

Most manufacturers have chosen to woo customers away from *VisiCalc* by offering a more refined, more feature-laden spreadsheet as an alternative. This race for a better spreadsheet has led to a number of programs which take the possibilities of *VisiCalc* well beyond the original bounds. *Perfect Calc* is one entrant into this "super spreadsheet" race.

*Perfect Calc* can be used for all the standard spreadsheet applications. Like *VisiCalc*, it allows a user to create and edit a large, interlinked, rectangular table of numbers and formulas in an intuitive manner. Each worksheet can have up to 52 columns and 255 rows. The range of applications to which this simple capability has been put is staggering, but the vast majority of owners use their spreadsheet simply to analyze or project financial data. They model their electronic spreadsheet on an accountant's (paper) spreadsheet, which has financial categories as rows and time intervals (months, years) as columns. Additional rows might be sums or other calculated items.

Perfect Software, Inc., the company that brought you the respected *Perfect Writer* word-processor, chose to extend the basic spreadsheet in two directions. *Perfect Calc* offers refinements not found in the original *VisiCalc*, and it offers a powerful new capability as well.

Let's start with the refinements. Perhaps the nicest single feature of *Perfect Calc* is the manual, a 7-inch by 9-inch softcover book. (Amusingly enough, the publishing industry calls this sort of binding "perfectbound.") The paper has a pleasant

texture, without the harsh glare characteristic of the IBM manuels. The typography is crisp, the diagrams informative, the writing intelligent and clear.

The manual starts with an introduction to spreadsheets, leads the reader through e series of chapters and tutorials expleining how to use Perfect Colc, and ends with a discussion of several sample spreadsheets. The writer struck a good balance between reference and tutorial meterial. The manual is generic, meaning it isn't written specifically for the PC implementation of Perfect Calc. That would usually be considered a problem, but since this implementation in no way takes advantage of the PC's unique features, the generic manual is appropriate.

There are, however, a couple of anomalies. The discussion of memory managemant (described in an appendix) and occasionel references to "alternate commend sets" don't apply to the PC. And I never did figure out if this implementation supports what the manual calls a "function library." But overall, the manual is well executed, and very attractive.

Perfect Colc offers unusually axtensive call formatting capabilities. Almost every spreedshaet allows individual formatting of cells, but some require all columns to have the same width. Perfect Colc permits column widths to vary, to accommodate those wida "titla" columns, while keeping the others narrow. Cells whose contants are labels can ovarflow into neighboring cells, provided the neighbor is empty. Again, this is handy for column titlas, which might span two reel columns. As a default, each cell displays the result or value of that cell, but you have the option of displaying the cell's formula instead.

***PERFECT CALC permits column widths to vary, to accommodate those wide "title" columns, while keeping the others narrow.***

Perfect Colc can format the cell value in decimal, scientific, dollar, or graphic notation. Graphic notation provides a primitive plotting capability by substituting a scalad number of asterisks for each value. Cells can also be "locked;" thet is, you can specify that they cannot be altered without first executing en "unlock." Templates—skeletal spreadsheets in which values are later entered—should be locked.

PC users with color monitors can choose which colors Perfect Calc will display by running a simple, menu-driven instellation procedure.

The program has a rich assortment of cursor movement controls. The typical spreedsheet progrem hes only the baslc four cursor controls (up, down, left, right). Perfect Colc adds page up, page down, page left, page right; also, commands to move the cursor to any edge of the spreadsheet: left edge, right edge, top, end hottom. You can also search for the next unlocked cell. Cursor control is further enhanced by a "rapeat" command. To mova left ten calls, simply move left once, then tell Perfect Calc to repeat the operation nine times. Nice.

Perfect Colc's active spreadsheet can be divided into rectangular regions. Moving and copying regions from one part of the spreadsheet to another, printing a

## EasyCalc: The Perfect Stepchild of Spreadsheets

*Budget-priced EasyCalc uses a less sophisticated approach to handle multiple spreadsheets—but it works.*

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(213) 257-2026
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**Requires:** 64K, one disk drive.

CIRCLE 633 ON READER SERVICE CARD

When I first received EosyColc, I didn't take it very seriously. Sure, I glanced through tha documentation and tried it out. But it's easy to become jaded, to look closely only at the high flying, heavily advertised products, and ignore the less well known companies.

I was more impressed after carefully reading the manual. EosyColc has nearly all of the good features of Perfect Colc, including the advanced formating, the numerous cursor control commands, and so on. However, it doesn't have the "regions" of Perfect Colc, nor can you "lock" calls. A more lmportent difference is that EosyColc can't handle multiple spreadsheets in memory at the same time. lnstead, lt allows you to make references to other spreadsheets stored on disk. Given tha limited memory utilization, which it shares with Perfect Colc (and many other rivals), the EosyColc approach actually seems better.

The program also allows forward references: it deduces their existance and properly recalculates the spreadsheet. This, for example, means you can put column sums at the top of a column as well as at tha bottom. Most spreadsheets don't allow the sum to appear at the top.

EosyColc has a better user interfece than Perfect Calc. The PgUp key and its friends do what I expect, and the rest of the cursor commands are easily rememberad. The Help function is at least somewhat context sensitive. If the program is in a special moda, like command mode, then pressing the "?" key for help will provide information specific to that mode. Although not up to the standard of the Perfect Colc manual, which looks much better and is written in a more conversational style, the EosyColc manual is quite clear and to the point.

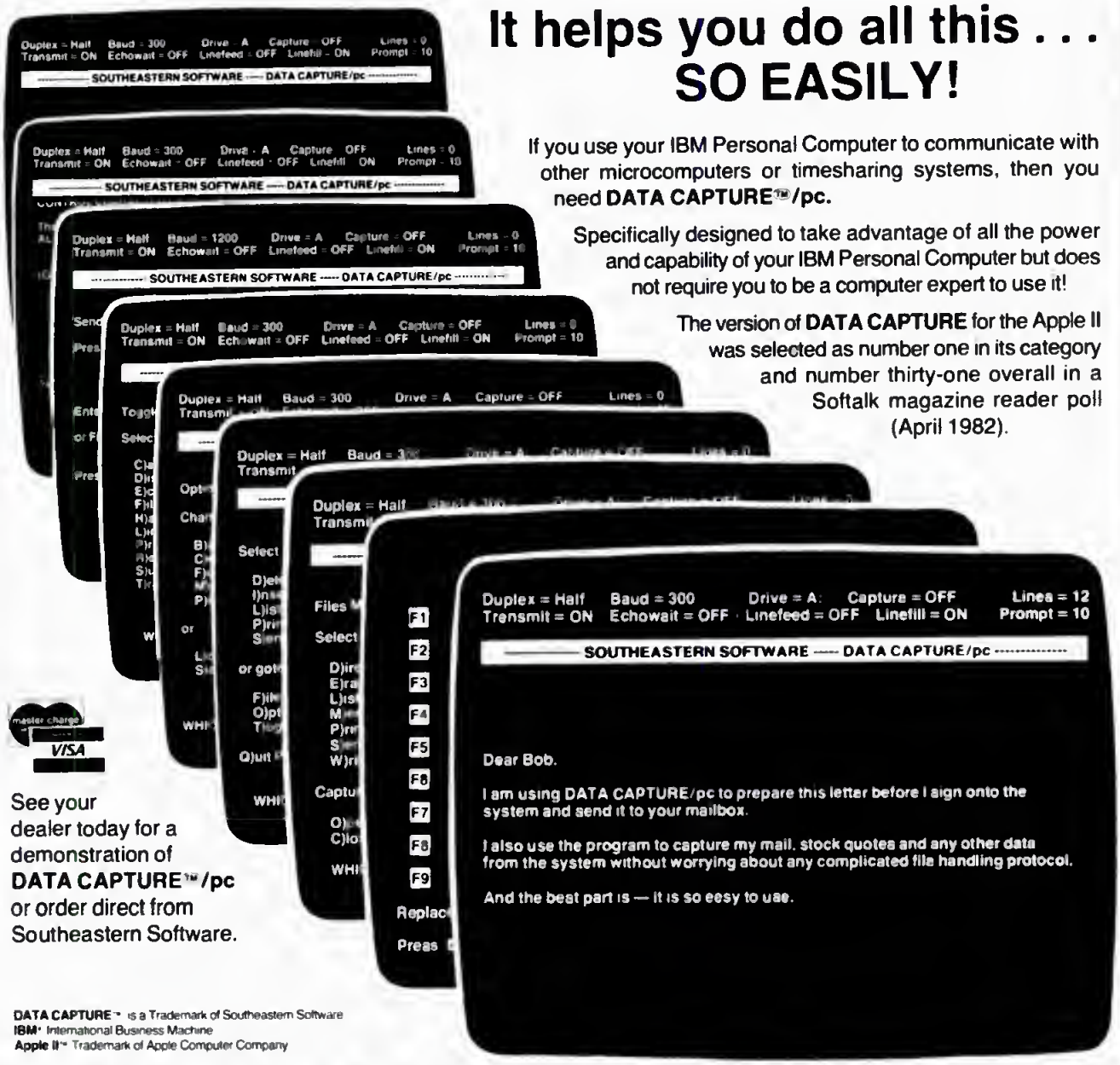
EosyColc looks suspiciously like a version of Perfect Colc tailored to the PC. And so it is; close inspection of the two manuals reveel that both Perfect Colc and EosyColc were written by the same author.

And now for the bad news. EosyCalc, although in some ways bettar than Perfect Colc, still doesn't have the polish of other available spreadsheets. lt has its share of bugs. I crashed this program, too. —*H.H.*

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CIRCLE 420 ON READER SERVICE CARD

region, and limiting recalculation to a single region are functions you may find useful when working with large spreadsheets

***UNLIKE SOME OF its rivals, Perfect Calc has no sorting capability, nor can it handle simultaneous equations.***

that have several conceptually independent subparts.

Unlike some of its rivals, *Perfect Calc* has no sorting capability, nor can it handle simultaneous equations. If a worksheet contains forward references, it is up to you to recalculate the model since *Perfect Calc* won't handle this by itself.

Let's step back and think about the implications of these features. What is their impact on the spreadsheet user? Although the enhanced formatting commands give the printouts a touch more class, the thrust of these enhancements is to simply make it easier to get the job done. None of these refinements expands the usefulness of the program.

The one feature that gives *Perfect Calc* claim to the "super spreadsheet" category by really increasing its usefulness is its ability to link several spreadsheets together. Spreadsheet models are normally stored on disk. In order to do anything at all with them, you must first load them from the disk into the computer's main memory. *Perfect Calc* is no different—except that it can hold up to seven different spreadsheets in memory at once!

A formula in one spreadsheet can reference a value in a different in-memory spreadsheet. *Perfect Calc* lets you split the screen into two independent windows, allowing you to see two spreadsheets at once. There are commands to switch

spreadsheets in and out of window synchronize spreadsheets (so they together), and so on. What good is all it provides the capability to accur build a hierarchy or network of mod

Consider the idea of "posting" as i accounting system. Individual entries subsidiary journal or ledger are total then, only the totals are entered in main ledger. That process is easily re

***PERFECT CALC can hold up to seven different spreadsheets i memory at once!***

sented by multiple, linked spreadsheet The many operating divisions of Meg corp are likewise candidates to be linke in this spreadsheet game.


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CIRCLE 211 ON READER SERVICE CARD

A simpler but equally useful application is defining several different spreadsbeets whose sole purpose is to print a report. Each of these report formatters might gather specific information from one mein spreadsheet which contains all the data. For example, the main spreadsheet might be a ledger. One reporting spreadsheet could calculate and print the income stetement, and another could calculete and print the baiance statement.

*A 65K VisiCalc model just won't fit into Perfect Calc.*

Even better: the spreadsheets, once in memory, can be linked together so that a command to recaiculate one wiii automaticaiiy recaiculate all subsidiary spreadsbeets. Once the subsidiary spreadsheets are linked, they are eutomaticaily loaded by *Perfect Calc* wbenever the main spreadsbeet is loaded. In principle, this muitipie spreadsheet feature, with its various options, is very attractive.

All of the linked spreadsbeet models have to be in memory—not on disk—at the time of reference. This makes access faster, but also increases the likelibood of running out of memory. The prospect of running out of memory is, unfortunately, all too theatening, as *Perfect Calc* can handie no more than a totai of 57K of spreadsbeet dete. This is, without doubt, the Achilles heel of the program. Even I, a moderate, occasional spreadsheet user, have created a 65K *VisiCalc* model; it just won't fit into *Perfect Calc*. Moreover, the newfound ability to stuff up to seven models into memory at once makes running out of memory aimost inevitabie.

An ennoyance of a rather different sort is the user interface created by *Perfect Calc*'s designers, to the extent thet this is a matter of taste, my taste differs markedly from theirs. Nevertheless, there are objective grounds for criticism.

*Perfect Calc* works like *Perfect Writer:* anything end everything is done by keying in commands consisting of a sequence of characters, usuaiiy—but not always!—while holding down the control (Ctrl) key. Many programs work in a similar manner, including *WordStar*, but the best ones pro-

*Although a few of the standard PC keys work as expected, most don't.*

vide a menu or prompt showing possibie choices to help e novice learn the commands. Not *Perfect Calc*. You gotta memorize 'em, and believe me, it's not easy.

Among the approximetely seventy dis-


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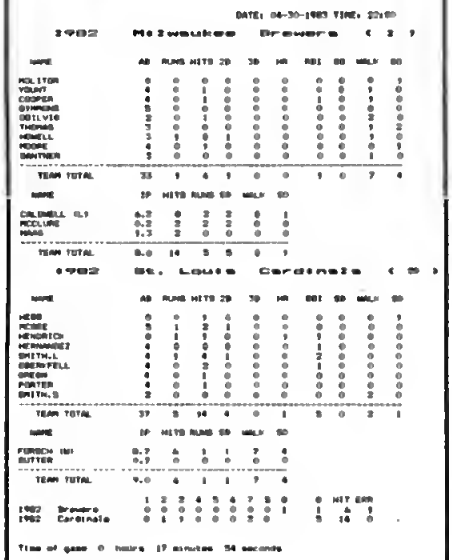
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tinct commend sequences are many thet seem similar. For example, the sequence "Ctrl-x w" changas the column width, but "Ctrl-x Ctrl-w" writes the spreadsheet to a file. Tha commands may look similar, but their effects are completely different. I don't like that at ell. To confusa matters further, although a faw of the standard PC keys work as expacted (the up arrow kay moves tha cursor up), most don't (the PgUp key does nothing; instead, you use "Ctrl-z" to move up one page).

The online Help function leavas a good deal to be desired. If you ask for help, *Perfect Colc* displays a list of topics. Choose a topic, then *Perfect Calc* gives a brief summary of applicable commands and key sequences. That's clumsy.

Better programs have what ere called "context-sensitive" menus or Heip functions. A context-sensitive Help function makes e guess at what you might need, and provides the necessary information right eway, saving you the bother of reading through half a page of unwantad information. Such a scheme works well with programs thet hava logically grouped key sequences. If all *Perfect Calc* commands that eccessed files started with "Ctrl-f" (unfortunately, they do not), then pressing the Help key after pressing Ctrl-f would provide assistance with file commends. Simiierly, the main Help menu might list all possible control prefixes, one to get at each group of commands.

There are othar good ways to integrate

***THE CLUMSY USER interface makes Perfect Calc needlessly difficult to learn.***

help functions and commands; my point is that *Perfect Calc* is not up to par in this respect. *VisiCalc* has abbrevieted, context-sensitive prompts. Many of its descendents have longer, claarer prompts of this sort. For this reason alona, thase programs are easier to learn.

The clumsy user interface makes *Perfect Calc* needlessly difficult to learn. Occasionel users will find it hard to

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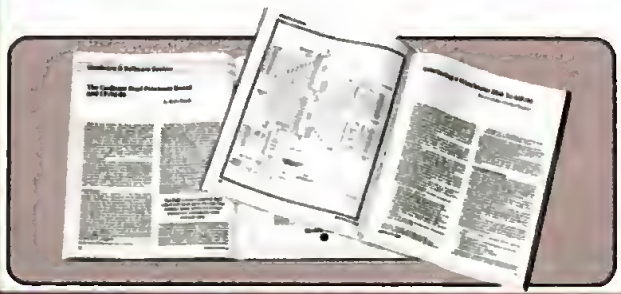
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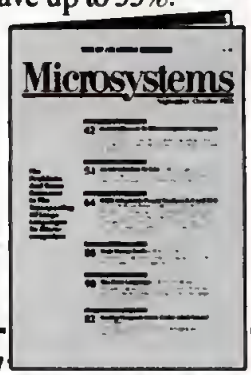
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remember after first learning it. *Perfect Calc* advocates might argue that this style of command language is hard to learn but easy to use. Fair enough—if you use *Perfect Calc* three or more times e week, I predict you'll eventually get the hang of it. It is, eccording to the menual, very much like *Perfect Writer*, so perhaps regular users of that program would not have such difficulties with this spreedsheet.

**PERFECT CALC *updates the screen very slowly, much more slowly than other spreadsheets.***

In shopping for a spreadsheet, you should also keep in mind that there are database management systems, graphics packages, accounting systems, pre-defined templates, end books eveilable to the *VisiCalc* user. A *Perfect Calc* user can rely upon none of these resources, because the program neither supports the DIF files used by most business graphics programs, nor is its normel file format compatible with *VisiCalc*.

The manufacturer's PC implementation of *Perfect Calc* has more than a few unpolished spots. *Perfect Calc* updates the screen very slowly, much more slowly than other spreadsheets. The contents of my spreedsheet disappeared when I ran out of memory; the progrem also gave no warning of floating point overflows or underflows. Even worse, I maneged to crash the program several times—always e bad sign.

The features of *Perfect Calc* compare well to many of the other spreedsheet progrems. If *Perfect Calc* were anything but a spreedsheet, I might forgive its weak points and praise it for its innovations. But, in the ultra-competitive world of super spreadsheets, *Perfect Calc*'s problem areas—the limited memory utilization, the idiosyncratic user interface, end the sloppy implementation—are real liabilities which overshadow the advantage of its multiple spreadsheet capability.

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*Through The Financial Planner, the PC speaks a financial language that goes over the heads of most spreadsheets, but is easily understood by people, even on their first encounters.*

# The Financial Planner's Customizing Language

The Finonciol Plonner
FInonciol Plonning Lanouage (FPL)
Ashton-Tate
10150 West Jefferson Blvd.
Culver City, CA 90230
(213) 204-5570
**List Price:** $700

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"Oh, no, not another spreadsheet!"

That was my first impression of The FInonciol Planner from Ashton-Tate. Since the invention of VisiCalc, many have attempted to duplicate its success. Granted that microcomputers lend themselves readily to the task of spreadsheet analysis, but there is a need for even more sopbisticated financiel planning programs. The Finonciol Planner, also called the Finonciol Plonning Lanouage (FPL), is a refreshing move in that direction.

The push towards increasing the memory capacity of the PC has been prompted largely by the constraints that the 64K limit placed on spreadsheet capacity. The improvement of the microcomputer and the increased sophistication of spreadsheet programs go hend in hand. Until recently, most of the ideas for new software originated with and were developed by e smell handful of bardy entrepreneurs. The best ideas heve been improved upon or duplicated. But recently, the softwere business has taken a backseat to leading-edge hardware technology.

With the development of more sophisticated 16-bit microcomputers, such as tbe IBM PC, new opportunities, formerly available only on time-sharing end mini computers, are now within the reach of personal computer users. The increased capacity of the PC makes it practical to scale down programs that were developed for the larger computers. Consequently, sopbisticated software, like The Finonciol Plonner, is quickly becoming available for the PC. In fact, those femilier with Autotob and *Infotob* on mainframe end time-sharing systems will find them very similar to The Finonciol Plonner.

*SHOULD The Financial Planner become an accepted standard, there will certainly be some commercially available front-end programs for it.*

### A Financial Programming Language

To best understand where The Finonciol Plonner departs from mere spreadsheet analysis, you should examine the concept behind Ashton-Tate's very successful dBose *II* program. Most programs written for micros take advantege of the real-time interactive capebility that the personal computer affords. They generally present menu-driven approaches to specific problems. dBose *II* and The Finonciol Plonner go beyond this and actually create an operational language that can be used by relatiaely unsophisticated users for programming after a very short learning period. The edventage this affords is that a person with a reasonably adequate understending of the process of programming can very quickly program a custom application that even a computer neophyte can use.

When computers are used at home as e hobby, this is not very important. However, businesses measure the worth of an expenditure by the returns it produces. The quicker e computer can justify its

existence in terms of profit, the better.

Since the *FPL* requires the user to have a basic understanding of financial planning, I will not spend much time in this area. Instead, I will briefly review some of the concepts involved and provide an example of financisl situation modeled by *The Finonciol Plonner*.

The concept behind financial planning is the interrelational sccumulation of chronologically ordered information in order to project future events. What formerly took hours with a psper and pencil has now been reduced to a few minutes of work with a computer. The most time-consuming portion of this process is the design of a spreadsheet model and entering of data. "VisiClones" sre, for the most part, cell-oriented; that is, each cell is considered an individual entity. The *Finonciol Plonner* makes the same departure as *MicroPlon* of orienting the entry and projection of data on a row-by-column basis. This saves time; it also encourages a different type of thinking. The program's author has designed a language that can be used to quickly alter the data in the file. This can be done on an interactive basis or by editing in a word processing fashion.

*The Finonciol Plonner* is composed of two menu-driven subsystems. The first part is the Editor. This works much like a line editor, allowing the user to enter commands that will later be processed. The *Finonciol Plonner* supports a sophisticated high-level language, in some ways similar to *dBose II*. Commands are simple English words that can be abbreviated for speed and simplicity. Through the use of the Editor, you can define what the model will look like in terms of rows and columns, include initial data, express formulss, snd define a program path. You can even include text to prompt the user for input that will later be used in calculations. The Editor constructs a file on disk that can be re-edited with either the Editor or a word processor.

Information entered under the Editor falls into one of three categories: data, rules, or text. The text is used simply to define the name of the rows and columns and the report titles. Text can be used from a previous model by inserting a FROM

*Figure 1: A list of the commonds in the Editor subsystem of The Financial Planner.*

**Add** { Rows {row name) | Columns {column name} | Variables {variable name} | Data {line number} | RUles {line number} | Text {line number} }
Adds new statements to the named section.

**Change** { Rows {row name(s)) | Columns {column name(s)} | Variables {variable name(s)} | Data {line number(s)} | RUles {line number(s)) | Text {line number(s)} }
Changes statements in the named section.

**DEFine** { {Define entire model) | Data {Define Data section) | RUles {Define Rules section) }
Defines the entire model description or the named section.

**DSS**
Loads the Decision Support System.

**Delete** { Rows {row name(s)} | Columns {column name(s)} | Variables {variable name(s}) | Data {line number(s)) | RUles {line number(s)) | Text {line number(s)} }
Deletes statements in the named section.

**Exit**
Terminates *FPL* and saves the most recent model description on the disk.

**FROM** filename {/LN}
Directs Editor to take input from the named file.

**HElp**
Lists all Editor commands with a brief description of each.

**Hold**
Holds or freezes information currently displayed on the screen.

**Init**
Clears model description of all statements.

**List** { entire model | Rows {row name(s)) | Columns {column name(s)} | Variables {variable name(s)) | Data {line number(s)} | RUles {line number(s)) | Text {line number(s)} } **TO** { {Printer) | {filename} } {/LN}
Lists all statements or only those in the named section to the printer, another file, or the terminal (by default)./LN suppresses line numbers.

**MONTHS** {number} {**START=mmm**) {**YEAR=yyy**) {**Quarters**} {'text'} {"text"} {**FISCAL NOTOTALS**} {{n))}
Creates names and titles of the months of the year for rows or columns.

**Quit**
Terminates the Editor session and returns to the Planning Menu.

**Renumber** { Data | RUles | Text } {current line number, {increment} new line number)
Renumbers all or specified parts of Data, Rules or Text section.

**RESERVE** number { Rows | Columns | Variables } {'text') {"text"}
Reserves a specified number of rows or columns.

**STET**
Restores the most recently changed section.

**UPPER**
**LOWER**
Toggles case translation between uppercase and lowercase.

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command and the other model's name.

### Defining Data

Generally, you fill a spreadsheet interactively on a cell-by-cell basis. Most spreadsheets provide some form of copy or replicate command, but the power of most of these commands is limited. Say, for example, you wanted to analyze a business's cash flow over a period of several months. The columns and rows are set up one at a time. *The Finonciol Plonner* shortens this process by using one command to define monthly headings, quarterly breaks, and annual totals. The same type of shorthand applies to the initial definition of the data. Data can be entered as a base value with a growth factor for the balance of the year.

I didn't experiment very much with the shorthand definition of data, but it seemed that the possibilities for relational data expression were extensive. The most interesting were the abilities to specify a

*Figure 2: A list of the commonds in the DSS subsystem of* The Financial Planner.

**CLEAR**
Clears the screen. Entries will scroll down the screen as they are entered.

**COLUMN** row list
Establishes the logical column for processing.

**COmpute**
Directs *FPL* to perform computations.

**COmpute/WT**
Computes one rule at a time for debugging purposes.

**DEFine Data**
Resets the data values to those in the Data section of the model.

**.n**
Sets the precision factor of the display to n decimal places.

**nD**
Moves the screen down n rows.

**EDITING** [string]
The editing control string for the entire model.

**Editor**
Loads the Editor.

**EXit**
Terminates *FPL* and retains the values currently in the data matrix.

**Footnotes**
To enter footnotes in the report.

**FROM** filename
Directs DSS to take commands from the named file.

**H**
Moves the screen to the upper left corner of the model.

**HElp**
Lists all DSS commands with a brief description of each.

**nL**
Moves the screen n columns to the left.

**B.MARGIN** n
Sets the bottom margin for reports to n lines.

**T.MARGIN** n
Sets the top margin for reports to n lines.

**Names** {Only}
Toggles the display of names, titles or both on the screen.

**Options**
Displays the current print option settings.

**OUTPUT TO** { filename / Printer / Terminal }
Directs the report to the file named, the printer or the terminal.

**OVER** n
Sets the left margin for reports to n spaces.

**PAGENO** Y/N
Controls whether page numbers are printed on reports.

**PAGESIZE** length, width
Sets the page size for printed reports.

**Print**
Prints the report.

**Quit**
Terminates DSS session and returns to the Planning Menu.

**nR**
Moves the screen n columns to the right.

**ROW** column list
Establishes the logical row for processing.

**Show** { row list / column list }
Controls which rows or columns are printed in reports or displayed on the screen.

**SPace** n
Sets the number of spaces between columns to n.

**Title**
To enter titles on the report.

**nU**
Moves the screen up n rows.

**UPPER**
**LOWER**
Toggles case translation between uppercase and lowercase.

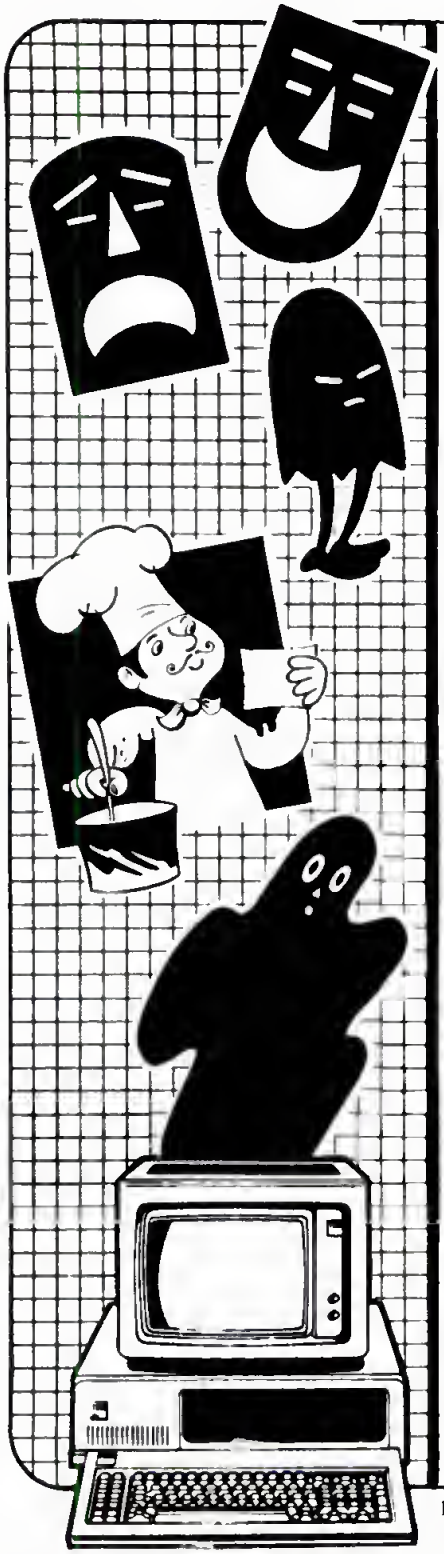
**Variables**
Displays the name and value of each variable in the model.

**W** n
Sets column width to n spaces.

**WHatif**
To enter rules at the keyboard and have them take effect immediately on the screen.

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CIRCLE 376 ON READER SERVICE CARD

# Modeling a Manufacturer with *The Financial Planner*

## *The Financial Planning Language can be used to model a financial situation and test out "what if" situations.*

Assume the following are true about a company's financial situation.

1. It is an operating business with current sales of $10,000 per month growing at the rate of 6 percent, typical for a small software business.

2. After three months, sales begin to grow at an 6 percent rate as a result of advertising.

3. Material costs, initially $500 per month, grow at a 3 percent rate for three months, increase to 5 percent for three months and will increase at a 9 percent rate during the balance of the year.

4. Support for the product stays constant at $1,000 per month for the first 6 months, increasing to $1,500 for the balance of the year.

5. Development is constant at $1,000 per month with the cost of $40,000 spread over 6 months for the development of a new product. The new product will begin to sell immediately and cause total sales to grow to a 25 percent rate.

6. Advertising initially costs $1,000 per month, growing at a rate of 15 percent per month.

7. Fixed expenses are flat for 6 months at $1,550 and increase to $1,685 to reflect a new office telephone for support of the new product.

The above assumptions are incorporated in the *FPL* program in Figure 3. When this program is run, the spreadsheets for this financial model are printed in two forms: the monthly budget (see Figure 4) and the quarterly budget with annual totals (see Figure 5). This report reveals that the company will show a growing profit each month after February.

This program can be used to test out different "what if" assumptions for the financial model. For example, what would happen if the new product took 8 months to develop and cost $100,000, rather than 6 months and $40,000? This can be tested by changing line 50 in the program's Data section as follows:

```
50 DEVEL=1000, 85100000, 5*1500
```

By running the modified program, the new monthly (Figure 6) and quarterly/annual (Figure 7) budget reports are generated, showing the financial effects of cost overruns in new product development. The monthly report's "Pre-Tax Revenue" line reveals thet the company will be in the red from February to August. By the end of the year, sales of the new product will raise monthly revenues to far higher levels ($35,476 in December), more than recouping the earlier deficit.

This is a very simplistic financial model, but it illustrates the type of situation that can be represented through the use of a few FPL statements. This model can be saved and modified later, either as a complete unit or partially. A menu driven command file was used to print the quarterly sets of reports. —*E.V.B.*

*Figure 3: A program, called TEST, created with* The Financial Planner.

```
MODEL A:TEST
ROWS
        SALES PRODUCT SALES
        COST MATERIAL COST
        SUPPORT DEVELOPMENT SUPPORT
        DEVEL DEVELOPMENT COST
        ADVERT ADVERTISING
        FIXED FIXED EXPENSE
        BLANK
        TOTAL TOTAL COST OF PRODUCT
        NET PRE-TAX REVENUE
COLUMNS
        JAN JANUARY
        FEB FEBRUARY
        MAR MARCH
        Q1 FIRST/QUARTER
        APR APRIL
        MAY MAY
        JUN JUNE
        Q2 SECOND/QUARTER
        JUL JULY
        AUG AUGUST
        SEP SEPTEMBER
        Q3 THIRD/QUARTER
        OCT OCTOBER
        NOV NOVEMBER
        DEC DECEMBER
        Q4 FOURTH/QUARTER
        YR TOTAL/YEAR
DATA
        10 MATHROW JAN-MAR,APR-JUN,JUL-SEP,OCT-DEC
        20 SALES=10000,3>*1.06,3>*1.06,#>*1.25
        30 COST=500,3>*1.03,3>*1.06,#>*1.09
        40 SUPPORT=6*1000,6*1500
        50 DEVEL=1000,6640000,5*1500
        60 ADVERT=1000,#>*1.15
        70 FIXED=6*1550,6*1685
RULES
        1000 MATHCOL
        1030 Q1=SUM[JAN-MAR]
        1040 Q2=SUM[APR-JUN]
        1050 Q3=SUM[JUL-SEP]
        1060 Q4=SUM[OCT-DEC]
        1070 YR=SUM[Q1,2,3,4]
        1080 MATHROW JAN-YR
        1090 TOTAL=SUM[COST-FIXED]
        1110 NET=SALES-TOTAL
```

growth rate and interpolete e total over several cells. Refer to Figure 1 for a complete list of the Editor commands. Since FPL operates es e language interpreter, commands for data dafinitions can be combined endlessly.

### Rules

Rules make up the most powerful part of the program; they allow the user to specify tha order and the menner in which the spreadsheet will be calculated. Normally, the order in which a spraadsheet is calculated is predefined by the designer of the software. With *FPL*, you become the dasigner; you determine which rows and columns ere to be calculated and in whet ordar. Rules are definad by lina number and can include repeat loops, data input, variable redafinition, conditional expressions, and output commends. Through the Editor, you are able to write a program that can display menus, input data, and print reports. In this way, even e relatively new user can operate *FPL* and obtain some very impressiva results.

### DSS—Decision Support System

The second part of *FPL* is what the manuel calls DSS, the Decision Support System. This is the interactive part of the program. Through tha use of DSS, The Finoncial Planner looks and acts lika a spreadsheet. DSS is commend-driven with English-like commands (see Figure 2). Once the user has defined a model with the Editor, DSS is used to run it. Here the best of both worlds exist.

DSS can be used to execute a saries of rules in program fashion or it can be command-driven by the user. Those accustomed to normal spreadsheets will find this part of tha program somewhat cumbersoma. Typically, spreadsheets handle screen updating when commands are axacuted. This is not true undar DSS. Claaring the screen requires a CLEAR command and movement about the spreadsheet is line-oriented, not cell-oriented. Onca you are familiar with the command language, though, you will be able to manipulete data quickly and debug progrems. By using The Financiol Plonner in this fashion, however, you miss its real edvantage; the built-in program function. Properly designed text and rules cen isolete the usar from much of the actual row-and-column manipuletion. This allows quicker

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## Reports

My experience with spreadsheets—and microcomputer software in general—is that very little hard copy report capability is built in. The real-time environment of microcomputers often makes the need for reports unnecessary. After all, who needs a steady flow of reports that are seldom read when the information is as close as your finger tips? As a result, the formatting of reports has been secondary to screen access information as a concern in most microcomputer software. This is fine when there is only one user and the person making the decision is the person running the computer. As computers are pushed into the business environment, however, the need to write more reports increases; especially when several people depend on the same information to make decisions.

*THE FEELING I got from using the Help feature was that it was an afterthought of the author, prompted only by competition from other software.*

*FPL*'s report generation language provides a rich set of commands for formatting reports. This, coupled with the ability to process the same data, but with different user-defined inputs and conditional checks, makes The Financial Planner a very powerful business tool.

## Documentation

As the microcomputer industry grows and comes of age, software packaging has become a strong marketing tool. Consumers now expect that when one pays $500 or more for a program, its documentation will be typeset and professionally laid out. Few realize that the process of packaging and documentation often takes as long as writing the program itself.

*Figure 4: Monthly budget report for the original model of a company's financial situation.*

**MONTHLY PROJECTION ASSUMING 6 MONTHS AND $100,000 DEVELOPMENT**

| | JANUARY | FEBRUARY | MARCH | APRIL | MAY | JUNE |
|---|---|---|---|---|---|---|
| PRODUCT SALES | 10,000 | 10,500 | 11,236 | 11,910 | 12,863 | 13,892 |
| MATERIAL COST | 500 | 515 | 550 | 546 | 574 | 602 |
| PRODUCT SUPPORT | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| DEVELOPMENT COST | 1,000 | 12,500 | 12,500 | 12,500 | 12,500 | 12,500 |
| ADVERTISING | 1,000 | 1,150 | 1,323 | 1,521 | 1,749 | 2,011 |
| FIXED EXPENSE | 1,560 | 1,560 | 1,560 | 1,560 | 1,560 | 1,560 |
| TOTAL COST OF PRODUCT | 5,060 | 16,715 | 16,903 | 17,117 | 17,373 | 17,664 |
| PRE-TAX REVENUE | 4,950 | −6,116 | −5,667 | −5,207 | −4,510 | −3,772 |

| | JULY | AUGUST | SEPTEMBER | OCTOBER | NOVEMBER | DECEMBER |
|---|---|---|---|---|---|---|
| PRODUCT SALES | 15,005 | 15,754 | 23,443 | 29,305 | 36,629 | 45,787 |
| MATERIAL COST | 632 | 669 | 761 | 819 | 893 | 973 |
| PRODUCT SUPPORT | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 |
| DEVELOPMENT COST | 12,500 | 12,500 | 12,500 | 1,500 | 1,500 | 1,500 |
| ADVERTISING | 2,313 | 2,660 | 3,059 | 3,518 | 4,046 | 4,653 |
| FIXED EXPENSE | 1,666 | 1,666 | 1,666 | 1,666 | 1,666 | 1,666 |
| TOTAL COST OF PRODUCT | 18,631 | 19,034 | 19,496 | 9,022 | 9,325 | 10,311 |
| PRE-TAX REVENUE | −3,627 | −280 | 3,947 | 20,282 | 27,006 | 35,476 |

*Figure 5: Quarterly report with annual totals for original model.*

**PROPOSED PROJECT WITH $100,000 DEVELOPMENT COST OVER 6 MONTHS**

| | FIRST QUARTER | SECOND QUARTER | THIRD QUARTER | FOURTH QUARTER | TOTAL YEAR |
|---|---|---|---|---|---|
| PRODUCT SALES | 31,836 | 36,666 | 67,200 | 111,719 | 239,421 |
| MATERIAL COST | 1,546 | 1,722 | 2,073 | 2,666 | 8,026 |
| PRODUCT SUPPORT | 3,000 | 3,000 | 4,500 | 4,500 | 15,000 |
| DEVELOPMENT COST | 26,000 | 37,500 | 37,500 | 4,500 | 105,500 |
| ADVERTISING | 3,473 | 5,261 | 8,032 | 12,216 | 29,002 |
| FIXED EXPENSE | 4,660 | 4,660 | 5,066 | 5,066 | 19,410 |
| TOTAL COST OF PRODUCT | 38,666 | 52,184 | 57,160 | 28,966 | 176,938 |
| PRE-TAX REVENUE | −6,832 | −15,489 | 40 | 82,764 | 62,485 |

*Figure 6: Monthly budget report produced after making changes the model to test the effect of a large cost overrun in developing a new product.*

**MONTHLY BUDGET PROJECTION FOR PRODUCT DEVELOPMENT**

| | JANUARY | FEBRUARY | MARCH | APRIL | MAY | JUNE |
|---|---|---|---|---|---|---|
| PRODUCT SALES | 10,000 | 10,500 | 11,236 | 11,910 | 12,863 | 13,892 |
| MATERIAL COST | 500 | 515 | 550 | 546 | 574 | 602 |
| PRODUCT SUPPORT | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| DEVELOPMENT COST | 1,000 | 6,667 | 6,667 | 6,667 | 6,667 | 6,667 |
| ADVERTISING | 1,000 | 1,150 | 1,323 | 1,521 | 1,749 | 2,011 |
| FIXED EXPENSE | 1,560 | 1,560 | 1,560 | 1,560 | 1,560 | 1,560 |
| TOTAL COST OF PRODUCT | 5,060 | 10,852 | 11,070 | 11,264 | 11,539 | 11,850 |
| PRE-TAX REVENUE | 4,950 | −352 | 166 | 626 | 1,324 | 2,042 |

| | JULY | AUGUST | SEPTEMBER | OCTOBER | NOVEMBER | DECEMBER |
|---|---|---|---|---|---|---|
| PRODUCT SALES | 15,005 | 15,754 | 23,443 | 29,305 | 36,629 | 45,787 |
| MATERIAL COST | 632 | 669 | 761 | 819 | 893 | 973 |
| PRODUCT SUPPORT | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 |
| DEVELOPMENT COST | 6,667 | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 |
| ADVERTISING | 2,313 | 2,660 | 3,059 | 3,518 | 4,046 | 4,653 |
| FIXED EXPENSE | 1,666 | 1,666 | 1,666 | 1,666 | 1,666 | 1,666 |
| TOTAL COST OF PRODUCT | 12,797 | 8,034 | 8,486 | 9,022 | 9,623 | 10,311 |
| PRE-TAX REVENUE | 2,206 | 10,720 | 14,947 | 20,282 | 27,006 | 35,476 |

*Figure 7: Quarterly annual report for the modified model.*

**PROJECTED DEVELOPMENT OF NEW PRODUCT OF $40,000 SPREAD OVER 6 MONTHS**

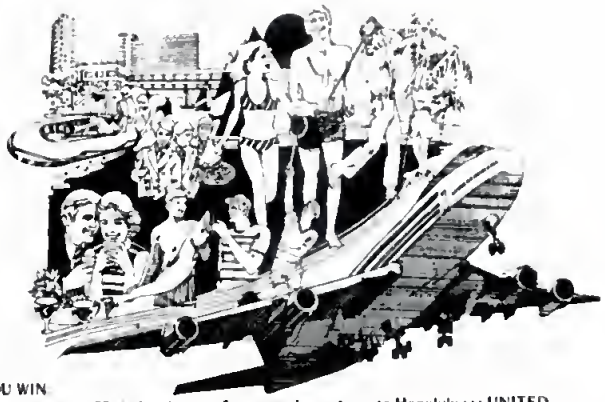
| | FIRST QUARTER | SECOND QUARTER | THIRD QUARTER | FOURTH QUARTER | TOTAL YEAR |
|---|---|---|---|---|---|
| PRODUCT SALES | 31,836 | 36,666 | 67,200 | 111,719 | 239,421 |
| MATERIAL COST | 1,546 | 1,722 | 2,073 | 2,666 | 8,026 |
| PRODUCT SUPPORT | 3,000 | 3,000 | 4,500 | 4,500 | 15,000 |
| DEVELOPMENT COST | 14,333 | 20,000 | 9,667 | 4,500 | 48,500 |
| ADVERTISING | 3,473 | 5,261 | 8,032 | 12,216 | 29,002 |
| FIXED EXPENSE | 4,660 | 4,660 | 5,066 | 5,066 | 19,410 |
| TOTAL COST OF PRODUCT | 27,001 | 34,654 | 29,337 | 28,966 | 119,938 |
| PRE-TAX REVENUE | 4,835 | 4,011 | 37,873 | 82,764 | 119,483 |

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For The Finonciol Plonner, Ashton-Tate has done a straightforward job of documentation. Tha first few chapters lead tha user through a series of lessons teaching the basics of FPL. Each chapter covers enough information so as not to bora a person familiar with computers and at the same tima does not overwhelm the new user. The latar part of the manual contains a mora detailed breakdown of tha program oparation, including examplas. A reference card of commands is also provided.

### Program Help Facility

To help users not used to reading computer manuals, some software now incorporates the manual's information in the program itself. After you press some key, usually the ? key, several lines to several pages of text will appear on the screen as a guide. In most cases, this feature acts only to jog the memory of a person already familiar with the program. Unfortunately, tha sophistication of software has not reached the point where the on-screen Help messages are cross-referenced to tha manual. If that were the case, then you would have quick access to the section of the manual that would provide an expanded explanation of the necessary command or input.

FPL does allow a breakdown of the Help messagas according to the command you're interested in. This systam, however, presupposes that you already know the command; in tha beginning, this is most often not the case. Therefore, you end up choosing to display a complete screen of information for all the commands. Tha feeling I got from using the Help feature was that it was an afterthought of the author, promptad only by competition from othar software. I found that the cross-reference card was much more conveniant to use than the on-screen Halp.

### Best Use of FPL

The true worth of a software package is best maasured by tha need that it fills. Well-programmed softwara if poorly matched, can be as disastrous as software that simply does not work. This matching process works best when the user has a clear picture of the need that tha program is intended to satisfy. Effectiveness is sometimes difficult to determina at first. Often you are bast off buying a limitad software package at a very low price to test how this type of program fits your naads. Onca a good match batwean the computer and a need is determined, a more sophisticated program is worth your money.

What people often fail to realize on a first encountar with a microcomputer is the amount of tima commitment tbat will be necessary before producing practical results. Often the hardware cost is the smallest component of the package's valua; programs and data are usually worth much more. Microcomputer software has been relatively cheap because such things as word processors and spreadsheets can be mass marketed. But costs changa dramatically when programs are custom tailored to meet specific needs. d*Base II*'s remarkable success has been a direct result of the tima it saves in producing custom applications and reports. The Finonciol Plonner takes the concept of financial planning into tha realm of inexpensive customization. The main thing you have to keep in mind before you buy The Finonciol Plonner is that somaone in your organization will have to be able to understand and write simple program logic if the full benefit of the program is to be realized. This is not as hard as you might think, but it does require some dedication on the part of a computer novice.


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**The Bottom Line**

Overall, The Finonciol Plonner is a superior product. I found it very easy to leern and use. The PC version overcomes some of the memory limitations of 8-bit spreedsheets. Most spreadsheets converted for PC-like computers have memory access limited to 128K. What this meens is that the first 64K of memory is used for the program and the data is essigned to a separate 64K of memory. The Finonciol Plonner seems to heve escaped some of this limitetion through a file buffering method thet tekes full edventege of the PC's memory. Unfortunetely there is no counter or other reminder of the amount of remaining disk spece, as provided with other spreadsheets.

The programming feature is very powerful and is not commonly fouod in spreadsheets. Since The Finonciol Plonner will also be used es a spreadsheet, it would be nice if e fast screen-eddressing option was available. This could be done with a separate module thet would make the progrem more user-friendly.

Some of the commends that were common to the Editor and DSS hed different functions in the different modes. The microcomputer field is so new that few industry-wide standards have been set. It is unfortunate thet e leeding manufecturer cannot even set a standerd internally.

FPL allows conversion to and from text files so that a smart programmer could use this progrem to emulete Context's MBA or MicroPlon with Memo Writer. This would require a bit of work, but the tools are there. Ashton-Tete is obviously missing some of the potential of this merket, es evideoced by the number of front-end programs that third-perties have made availeble for its dBose II. Should The Finonciol Plonner become en eccepted standard, there will certeinly be some commercielly aveileble front-end programs for it elso.

The retail price of The Finonciol Plonner is $700. Thie is higher than spreadsheets generally run, but spreadsheets usuelly do not contein the features found here. The only progrem on the merket that is comparable is MicroPlon from Chang Labs. If the optionel consolidetion module is added to MicroPlan, its price is at the same level as Ashton-Tete's.

Since text files can be trensferred from The Finonciol Plonner to other progrems thet are compatible with text files, you might consider purchesing a simple spreadsheet for quick calculations and The Finonciol Plonner to be used by office personnel who are femilier with menu-driven programs.

Ashton-Tete's support policy is superior to those of much of the rest of the microcomputer industry. It maintains a hot line for technical questions end eppears to be quite capeble of enswering even sophisticeted questions. Its updete policy is also excellent, ellowing for $50 updetes when evailable as well as correction, at no cherge, of eny bugs that eppear. This is refreshing in an industry that often forgets the meening of support. */PC*




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APPLICATIONS/TODD KATZ

*Ashton-Tate's popular database can be used as a high level language. Its new run-time version, dBRUN, should soon find a place on many program disks and programmers' toolshelves.*

# dBASEing
# The Language

*dBRUN*
Ashton-Tate
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Culver City, CA 90230
(213) 204-5570
**List Price:** $100 par licanse (see article)

**CIRCLE 591 ON READER SERVICE CARD**

Ashton-Tate's d*BASE II* is widely used as a powarful database management system. Some of its more sophisticated users realize that it can be treated like a high-level programming language. Many of thasa programmers have used d*BASE II* to create applications programs of great complexity, making effactiva solutions to problams found in their specialized fialds.

Once a programmer has invested time, sweat, and expertise in an original program, there's a potential payoff in selling this software to customers with similar problems. Sometimes a business finds undertaking the development of a major piece of applications software is cost justified only by the potential for tha business—or the programmar—to market the resulting software.

Programmers who used d*BASE II* to write market-worthy software packages have found themselves in a bind. If they intanded to sell this software, they'd have to faca the fact that they had, perhaps unwittingly, become commarcial partners with Ashton-Tata. Up to now, Ashton-Tate has hald to a hard bargain that few programmers have been willing to swallow. The manufacturer had requlred that each copy o*I* the new program include a licensed copy of d*BASEII*. That axtra $700 has driven the price of most applications programs far beyond the market's reach.

Few programmers hava brought their software to market this way, especially since d*BASE II* has offered no protaction in raturn. The applications programs could be made available only in an interpreted form—that's unprotectad coda which purchasers would easily examina, copy, and pirate—especially if tha cost o*I* an Ashton-Tate license has upped the ante of the program's list price. These condltions have frustrated many programmers who might otharwise have takan advantage of d*BASE*'s powars as a language.

The makers of d*BASE II* hava finally takan saveral steps to make its partnerships with programmars happier. Ashton-Tata, has openad up communication by publishing *Applicotion Junction*, a newsletter that will publicize applications pro-

grams that use dBASE II. More significant is that it has released dBRUN: a run-time package that a third-party programmer can license to include with a product for only $100 a copy. In addition, applications programs can now be protectad from thair purchasers by using the dBCODE file in dBRUN for encryption.

**dBASE II USERS give the program commands through a high-level computer language.**

Tha impact of this change in Ashton-Tate's approach can be seen claarly in the exparienca of a programmer who chose to usa dBASE II as a language.

### Political Programming

When Hugh Poynor accepted the assignment of developing a comprehensive microcomputer program to manage the business and of a California stata-wide political campaign, he knew what he needed: a databasa to manage tha large lists oI contributors; an accounting system to keep track of campaign expaditures and income; and an editor to writa and print reports Ior the state's election commission and other agencies, as well as the thank you latters to contributors.

The program needed to ba flexible so that it could be adapted to changing requlrements and ragulations and, if necessary, repaired quickly iI an unforeseen bug should develop in tha midst of a heated campaign. It had to be so easy to usa that aven a campaign voluntear with no prior computer experience could at least do data entry. For these reasons, Poynor selected a menu-driven approach.

Furthermore, the program had to be transportable so that it could be used with 8-bit CP/M-based microcomputers, the IBM PC and other 16-bit systems. OI course, the source code of the program had to be "hiddan" to protect the programmer's investment of time and knowledge.

Having had 20 years oI computer experience, Poynor considered a number of options, including Microsolt's MBASIC; Digital Resaarch's CBASIC; CB-80, Microsoft's compiled BASIC; and Softech's version of UCSD-p Pascal. But the complexity of building a full-scale database in these languages was troubling.

An attractive alternative was dBASE II, a popular database manager developed saveral years ago by Ashton-Tate of Los Angeles. dBASE II usars give the program commands through an easily mastered high-level computer language with instructions such as ERASE, ACCEPT, STORE, IF, ELSE, ENDIF, WAIT, and RETURN. Using dBASE II, a wide variety of managament systems can be created, ranging in complexity from simple mailing list programs to complex menu-driven programs with many of lines of code.

Unfortunately, programs written in the dBASE II "language" are interpreted and will only run after baing callad by the main dBASE II program. Since the retail price of dBASE II is $700, the cost of selling a program written in tha dBASE II language is quite expensive by microcomputar standards. Anothar potantially sarious problem is that tha dBASE II instructions needed to create the program can become available to anyone using the program. With a faw cosmetic changes, a software pirate could sell Poynor's program under anothar name.

Fortunately for Poynor and for thousands of others fluent in the dBASE II languaga, Ashton-Tate has devalopad a solution to both problems. dBRUN, a run-time package for dBASE II programs that has been released recently, now makes it possible for dBASE II owners to sell the programs they have written in the dBASE language for a comparatively modest $100 run-time license.

### A Run-Time Package

What is a run-time package and how does it work? Although Ashton-Tate (in a move roughly equivalent to Toyota's trademarking the term "AutoMobile") has stamped a trademark on the word "Run Time," the concept is hardly original.

One of the earliest and most popular run-time packages was dasigned by Gordon Eubanks for his CBASIC language. (CBASIC and CBASIC-86 are now marketed by Digital Research.) Programs written in CBASIC are converted into what is known as intermediate coda. If you are using the compiler program, you can "interpret" this code later using anothar CBASIC program. Among the advantages of using CBASIC (and now dBRUN) is that it supplies a high degree of transportability between oparating systems. For example, programs written in CBASIC for 8-bit machines can run without modification on tha IBM PC under CP/M-86 using CBASIC-86. This was provan to be very useful during tha transition period after the introduction of the IBM PC, when there was comparatively little high-quality business application software available for the PC.

Under dBRUN, when the author is fully satisfied with his application program, he then runs it through a special fila callad dBCODE. The dBCODE file encrypts the dBASE II instructions, preventing the person using tha program Irom reading them. dBCODE also converts or "crunchas" tha words used in the dBASE II languaga to one or two character "tokens," reducing the size of tha program.

Onca tha dBASE program has been ancoded, it can only be usad In conjunction with the dBRUN program. According to the company, dBRUN implements "almost all of the faatures of dBASE II itself." Users of the program report that Iew iI any modifications are necessary Ior their programs to work under the run-time option. The obvious limitation for both the developer and the usar is that, like any program in any compilad languaga, once tha code has been committed to tha run-time package, it can only be modified by the original author who must return to his or har source program, make and test the changes, and run the revised program through dBCODE again.

**dBRUN SUPPLIES a high degree of transportability between operating systems.**

The addition oI a run-time option Ior dBASE II maans that non-programmers will be able to create highly customized database programs for individual custom-

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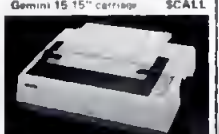
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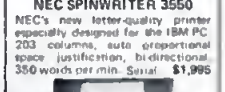
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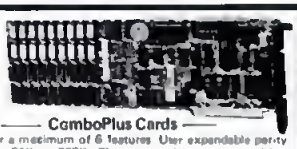
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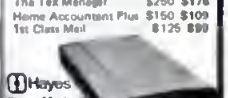
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ers, using the high-level d*BASE II* lenguege. This will probably lead to the creation of specielized programs such as Poynor's that are tailored not only for a particular industry, but for a particular city, state, or region. This strategy is clearly designed to set d*BASE II* apart from the growing crowd of high-quality database menagers competing for shelf space in the IBM PC software market. Among the other contenders are Innovative Software's *TIM* and integrated spreedsheet/databaee programs such as Context *MBA*, *1-2-3* from Lotue, and *KnowledgeMan* from MDBS.

Another significant program thet offers a run-time option similar to d*BRUN* is *Formulo* from Dynamic Microprocessor Associates. *Formulo II*, expected to be available for the PC in June, ie a menu-driven application generator that includes a basic accounting peckage and a screen design eystem. Appiications programs created with *Formulo II* run very quickly since the program generates code that closely resembles the computer's natural languege.

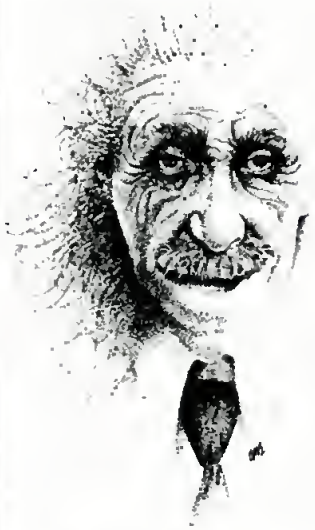
***PROGRAMMERS must become knowledgeable in the fields or businesses of their clients before they can design effective programs.***

### What Programmers Should Know

According to Hugh Poynor, programmers muet become knowledgeeble in the fields or busineesee of their clients before they can design effective programs: "As custom eoftware developers, one of our mein philoeophical cornerstones is that a dyed-in-the-wool programmer has no bueiness writing bueiness software. The best epplicetion eoftware euthor is someone with substantive knowledge in a epecial area. Dentists know the most about the requirements of dentists wanting to computerize e portion of their practice. Economists know about statistics. Inventory managers know about inventory levels and sales management. Most programmere don't understand anything about eny of these areas.

"For that reason, we, as application designers, openly acknowledge our weakness in any specialized area. Our first job when writing an application program is to become as expert in the specific field as the people we are working for."

Poynor and his partner/wife Lee followed this philosophy in the design of the campeign reporter program. Ae Poynor explained: "We spent two months reading regulations and interviewing our client, a campeign treesurer. During that time, no programming was done. When we feit we were indeed 'experts,' we designed the screens for the package which we showed to our client. Then, having made certain that the flow of information between the user end the program would be correct, we wrote the code." As a reeult, 8,000 linee of d*BASE II* code were written for the cam-

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paign reporting systems, which included multi-laval passwords, a built-in editor, end the ability to select a liet of potential contributors from critaria selectad by tha operator of the program.

One of tha baauties of the *dBASE* language is that much of the code that Poynor wrote for the $1,800 Colifornio Compoign Reporting System can be usad by him to create similar campaign reporting programs for othar states. A national campaign reporting syetem is also said to be in tha planning stages.

To add furthar valua to tha d*BRUN* option, Ashton-Tate is committed to after-sale support of *dBRUN*. A special newsletter called Applicotion Junction will soon bring new *dBRUN* programs to the attention of other *dBASE II* users and software marketars. Software standards, documantation guidas, and a marketing referral service celled d*BASE II* Applied are now being developed for *dBASE II* application programmers.

Programmers must purchase the d*BRUN* package for each program they plan to sell. Programmers wishing to sell d*BASE* epplications using d*BRUN* muet purchase the package directly from Ashton-Tata, file an application explaining the purpose and intended market for the program, and deliver copies of the program's user documentation and advertieing matarial. A minimum order of fiva d*BRUN* licenses at a cost of $100 each is required to enter the d*BRUN* application software business.

*THERE ARE VERY few things that dBASE II cannot do.*

Is *dBASE II* the right program for the businessman who wishes to either write a customizad database for his own business or eell a databasa to others? The answer is yas. Since its incaption, *dBASE II* has been regardad ae a high-quality product. Although it is not particularly fast by today's standards, there ara very faw things that *dBASE II* cannot do. Consequently, a large number of programmers and databasa designers have become fluent in tha d*BASE II* application language. In addition, a numbar of inaxpansiva, high-quality tools have been developed to make learning and using *dBASE II* easier. Among these are Fox & Geller's *Quick*code, d*Util*, *Quick*screen, and *dGraph* and HumanSoft's dBplus. If you are planning to use d*BASE II* or any othar program for a major project, howavar, you should talk to people who have usad tha product rather than just heard about it and explain to them the application you have in mind.

It is still too early to tell if d*BASE*'e shift from database to language will extend its commanding position in tha 8-bit CP/M computer world to the 16-bit PC marketplace. Given the success of software applications writars such as Hugh Poynor, however, indications seem positive. */PC*


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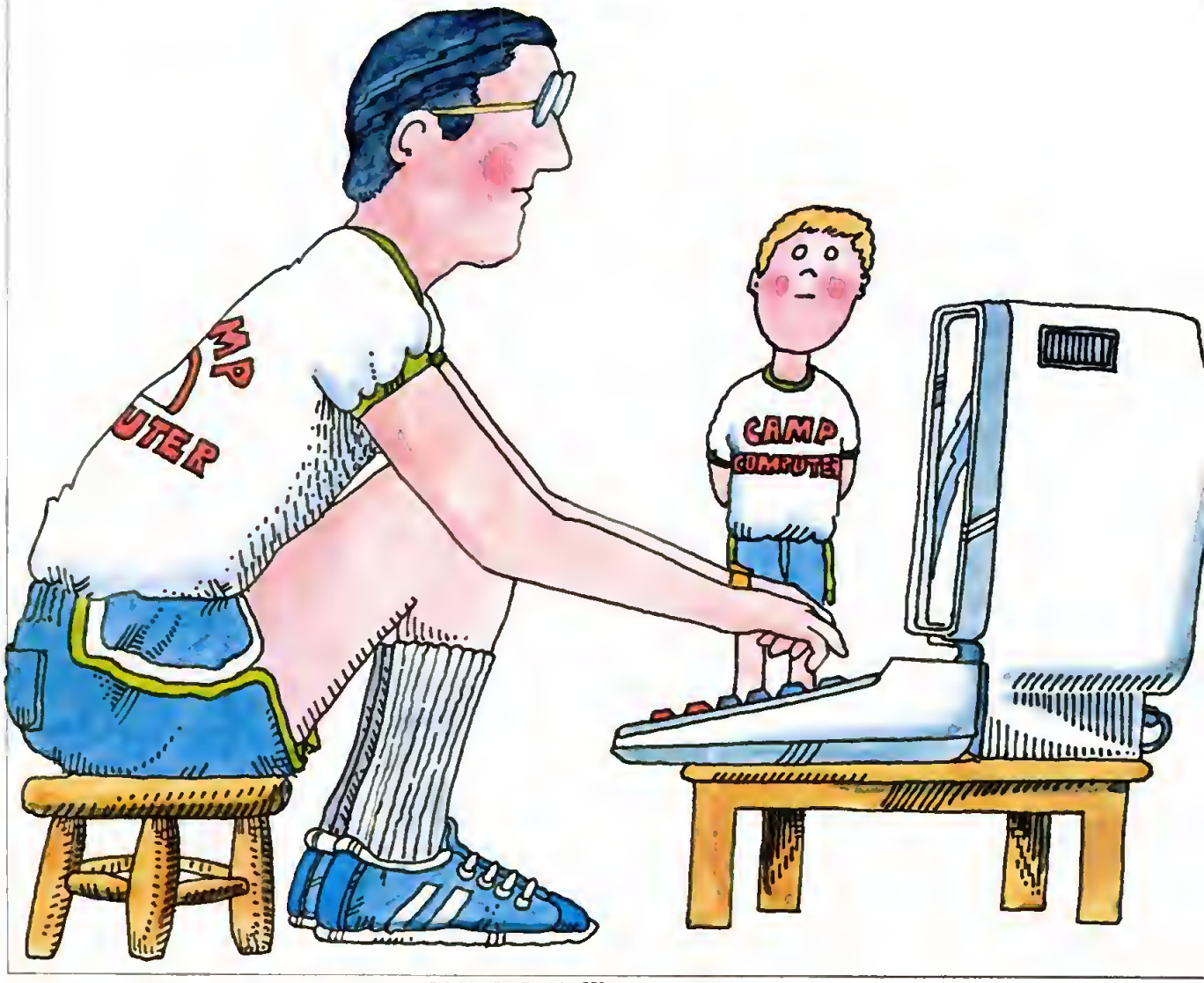
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CIRCLE 183 ON READER SERVICE CARD

*You probably know all about bunks, canoes, and nature studies for your little camper. How about software/programming percentages and computer/student ratios?*

# How To Choose A Computer Camp



Not so long ago, a child going to summer camp was in for braiding lanyards, laarning bird calls, and reading Indian smoke signals. But this summer's camper is just as likely to sign up for "hands on" time with a computer.

It's hard to believe that the first computar summer camp opened only 6 years ago. Intensive residential programs in computer scienca are now available in all regions of the continental United States. Though dafinitive figures aran't available, I compiled a 33-camp directory.

What do computer camps offer? At their bast, they giva a solid grounding in computer skills not routinely available in either public or privata schools, without excluding the traditional summer-camp activities. And, as the inheritors of a computer-oriented society, youngsters find this a major advantaga.

Computer-settings vary dramatically. Henry Dahlberg's computer camp located in the mountains outside Prescott, Arizona, offers a surprising juxtaposition of high-technology and frontier surroundings. At the other extreme is the "computar village" in Club Med's lush and luxurious Punta Cana resort in the Dominican Republic, which will offer workshops for both children and adults all this summer. Most camps are more urban. Many are sat on prep-school and small college campuses. Week-long, nonresidantial programs for suburban and city children in churches, synagoguas, and librarias (such as those offarad by Computer Camp International's Computer U) are a viable alternative for families that can't afford residential programs.

Tha camps solicit a varied clientele. Though most camps cater exclusively to children and teens, some offer family and adults-only programs. Thair organizations



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New York, NY 10018
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Avalon, CA 90704

**Camp CompuQuest**
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Lexington, KY 40533
(606) 278-9933

**Champlain College Computer Camp**
P.O. Box 670
103 S. Willard St.
Burlington, VT 05402
(602) 658-0800

**Computer Camp**
c/o Dixie College
225 South, 700 East
St. George, UT 84770
(801) 673-4811

**CompuCamp**
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Information Office:
5810 West 78th St.
Minneapolis, MN 55435
(600) 326-4615
(612) 635-0064

**Computer-Ed Inc.**
Babson College
99 School St.
Weston, MA 02193
(617) 647-0054

**Computer Camp at Yellow River Station**
Monona, IA 52159
(319) 539-2425

**Computer Camps International**
(Locations in East Hadam, CN; Whitewater, WI; Denton, TX; San Antonio, TX; Oxford, GA; Vincennes, IN)
310 Hartford Turnpike
Vernon, CT 06066
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Bluffton, IN 46714
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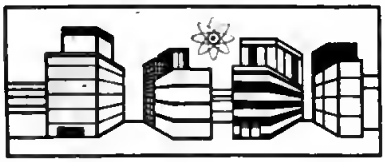
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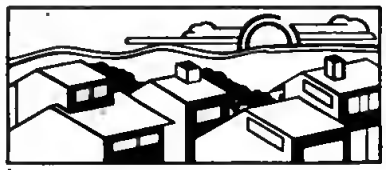
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ranga from wall-known chains such as Computar Camps International, CompuCamp, National Computer Camp, Original Computer Camp, and Champlain College Computer Camp to one-sita, indapendently-owned camps.

Tha procass of selecting a camp for yoursalf or your child is complex. Thare ara important differences in price, size, computer type, instructional quality, educational objectives, curricula and non-

**COMPUTER summer camps demand more from children than other camps do.**

computar activities. Not all the information you need can be glaaned from tha brochures. Decide what you want from a camp, what you can afford, then speak with staff members. Directors of the major camps say that thay walcome calls from prospective campers or their parents.

### Choosing a Camp

Tha following questions may help you decida on an appropriata camp for your child or teenager. Is your child suited to this type of experience? There's no question that computer summer camps demand more from children than othar camps do. In addition to instruction periods, campars usually spend a minimum of 4 hours in front of computers aach day. Children with academic or psychological problems may benefit more from camps that emphasize crafts and nature. However, kids needn't be whizzes to attand; good camps offar programs tailored to slower learners, too.

*How flexible* ore the curriculo? Clark Adams, director of the Connecticut-based Computar Camps International, says, "Because many computer course offerings are naw, teachers don't always know which matarial should be taught to which age group. Kids aren't learning computing in predictable, age-appropriate ways." This means that a 9-year-old camper may be taking a class geared to a teenager or vice versa. Tha 9-yaar-old and a 14-yaar-old may also be assigned to the same class with the same materials. This calls for a staff sensitiva to each child's capacities and an axtensive and adaptabla curriculum. The staff of CompuCamps, a Minnesota concern, conducts datailad telephone interviews with each child to pinpoint skill level before the child arrives. A good camp takes pains to balance a child's need for an appropriata lavel of stimulation with his wish to be with his own aga group. Be sure to ask camp personnel how

**KIDS NEEDN'T be whizzes to attend.**

they handle these considarations. Many of the larger camps enroll a population large enough to group children hy computer litaracy levels within thair age groups.

*How extensive* ore the curriculo? Clark Adams points out that children often have

## Computer Camps cont.

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Burlingame, CA 94010

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**Marist College Computer Camp**
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**Math Workshop**
College of Wooster
Wooster, OH 44961
(216) 263-2369

**National Computer Camp**
(Locations in Simsbury, CN; Atlanta, GA; St. Louis, MS; Portland, OR)
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Orange, CT 06477
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a great interest in general computer culture and like to be immersed in all aspects of it. The curriculum should be flexible enough to include a broad range of potential applications. Some experts urge parents to keep kids away from courses that are 100 percent programming. They recommend that at least 20 percent of the courses offered should be devoted to software packages in such categories as word processing, music, or accounting. Older teens often want to learn marketable word processing and accounting skills. Nearly

***ADULTS NEED good student/instructor and student/computer ratios.***

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Davis, CA 95616

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Sanger, CA 93657
(209) 787-2551

**Rocky Mountain Computer Camps**
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Boulder, CO 80302
(303) 442-6228

**Tar Heels Career Camps**
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(919) 967-6996

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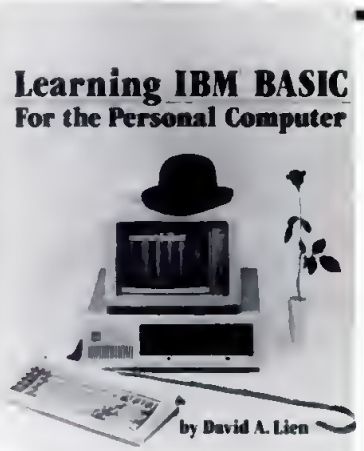
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all campers are interested in the non-commercial aspects of computing, such as playing and composing music, graphic designing, robot building, game designing and playing, and "telephoning."

***AN IDEAL instructor might have degrees in both education and computer science.***

Also check to see whether an "ongoing" curriculum is offered. If a camper successfully completes one course, is there a higher level course offered? Make sure too that languages are taught in a sensible progression: Is BASIC followed by Pascal, not Assembly?

What are the teachers' qualifications? To be effective, a computer instructor has to know as much about children as computers. If a summer program employs university-level teachers, make sure that they also know how to present material at a child's level. An ideal instructor might have degrees in both education and computer science.

Are there guest speakers? Though guest lecturers aren't a necessity, they can be very inspiring to older teens. Speakers can give teens a sense of the career options in the computer field.

How much computer time is scheduled? An inflexible program that either requires children to spend long hours on the computer or that severely limits the hours an interested child can spend on it are equally inadvisable. Try to find out about the scheduling options of the camp and decide if they are appropriate for your child.

What's the child-to-computer ratio? Many camps, including Vermont's Champlain College Computer Camp and the Antioch College Computer Camp in Ohio, offer a one-computer-per-camper ratio. This arrangement guarantees a child the maximum return for his computing time and is considered the optimal formula.

However, some experts question whether it's desirable for each child to have access to his own computer. National

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A - Ascii file transmission.
B - Ascii file transmission - PTR/PTP protocol.
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D - Toggle local display (on).
W - CompuServe Executive Terminal
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E - Exit program.

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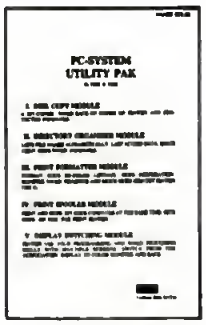
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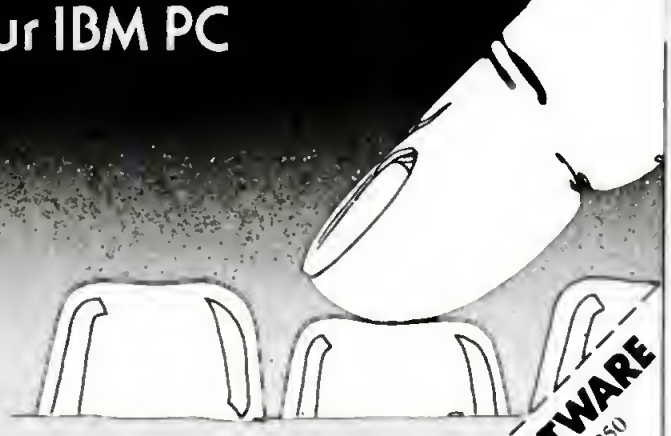

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Computer Camp founder, Michael Zabinski, says that he does not allow a one-child-to-one-computer ratio. His camp schadules two children per computer,

***MAKE SURE that you won't be learning about the loftier aspects of programming at the expense of your immediate concerns.***

based on his premise that children learn more in pairs.

*How* good ore the noncomputer offerings? In addition to computing classes, most camps also offer activities such as sports, crafts, dramatics, nature hikes, and conservation work. The Catalina Sea Camp at the Catalina Island Marine Institute in Avalon, California, combines computer with marine-biology studies. Consider too, tha quality of food and accommodations as well as opportunities for campers to mix with children from other areas and backgrounds.

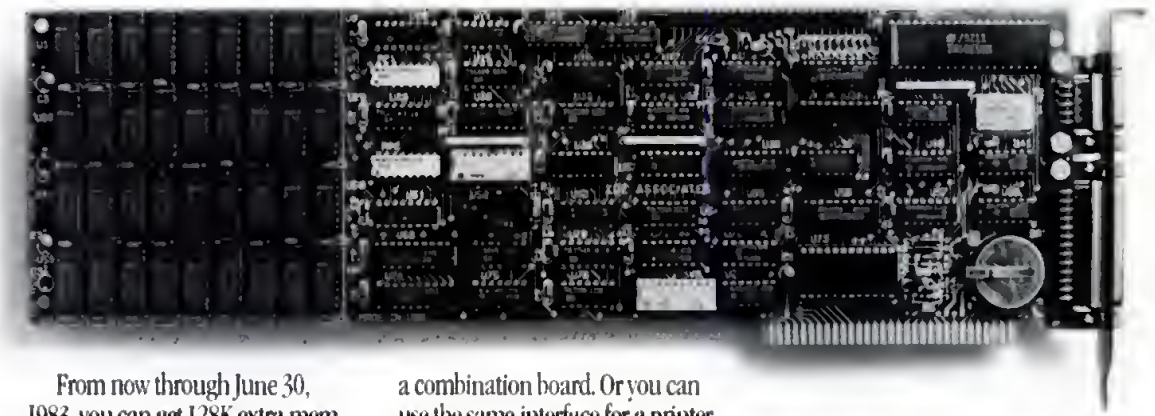
### Adult Computer Camps

Adults need cohesive, structured curricula, good student/instructor and student/computer ratios, high-quality instructors, and a pleasant environment. Their interests tend to be more specialized than children's, especially if they have just bought a computer. They may plan to learn word processing or to set up an accounting system for their home or business. If your aims are practical, make sure that you won't be learning about the loftier aspects of programming at the expense of your immediate concerns. You may not be interested in programming at all; you may just want to learn how to use good commercial software.

Although camp programs for adults often take a practical approach, they are not necessarily a substitute for a good computer job-skills class. If you are trying to add computer knowledge to your list of marketable skills, you should also investigate other academic programs. */PC*

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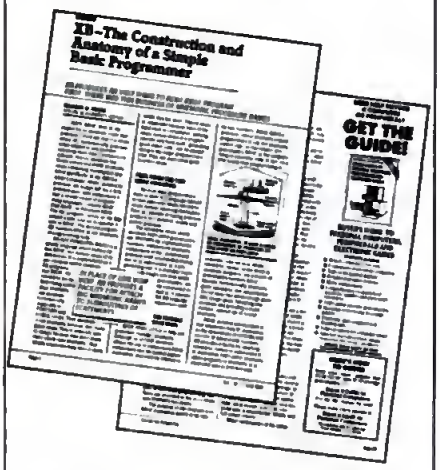
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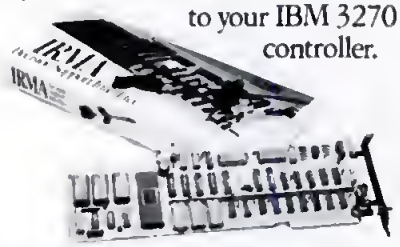
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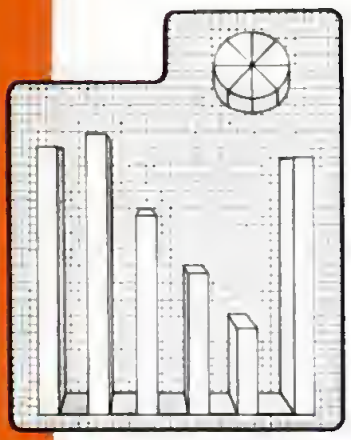
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EDITED BY BILL MACHRONE

*PC readers help each other by passing along their tips and tribulations. This time they've solved problems with printers and pauses.*

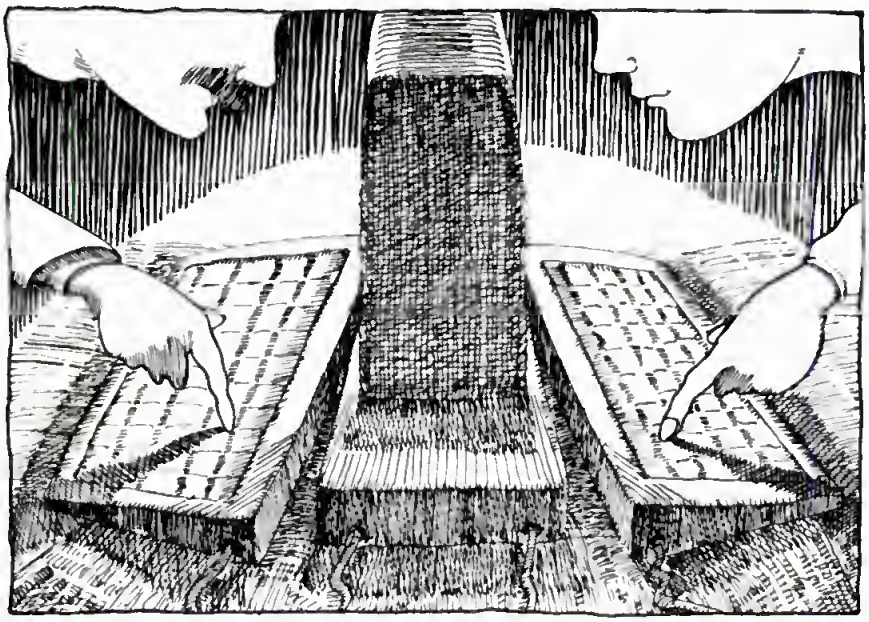
# User-To-User

This month's column addresses a number of topics that will be of interest to many: getting BASIC to print to a serial printer, overcoming copy-protection limitations with half-height drives, another time delay technique for BASIC programmers, and a couple of tricks you can do with BASIC to give you more control over programs and improve your productivity.

### Talking to a Serial Printer

When I bought my IBM PC, I also purchased an AST Combo+ card to provide additional memory, serial I/O, and a battery-backed-up clock. Since I didn't own a parallel printer, I didn't have a perellel I/O port installed on the Combo+ card. I also got the color/grephics adapter from IBM.

My problem came when I tried to print while in BASIC. After I set the COMM: speed, the MODE command worked very well in DOS 1.1 in steering the output from the usuel perallel printer to the Asynchronous Communications Adapter look-alike on the Combo+. When I tried to do an LLIST in BASIC, however, I got a "Device Not Availeble" error message. That really surprised me, because I thought BASIC was supposed to be device independent. I tried everything from soup to four letter words and nothing worked. Then I tried opening the COMM: device as a file and did a PRINT#. That worked! Elated, I tried LPRINT. Nope. Drat! Some




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nasty messaga. I knaw the printar was there since MODE had taken care of that. Or had it?

*SOME COPY protection schemes involve changing the gap between disk sectors.*

On a hunch, I borrowed a parallel printer adaptar card from the Computer Store in Rochester, installed it, and tried LLIST. It worked. LPRINT worked fine, too. I took tha parallal adapter card out and that nasty massaga came back. It turns out that BASIC is not so devica independent after all. It goes looking for tha parallel port long before it ever sends anything to be printed, even though PC-DOS will redirect the I/O. I installad a parallel I/O port on the Combo+ board and now I'm back in business. The connector for the interface wasn't required, just tha interface. Of course, if you have the IBM Monochrome Adapter you won't have this problem because that board already has a parallel interface.

Dale Dewey
D2 Enginaaring
Victor, New York

### New Heights with Half-Height

Many of your readers may hava purchased the new TEAC half-height floppy disk drives. If so, they may encounter problams reading some copy-protected disks. For example, the Microsoft *Flight Simulotor* may not load properly.

The problam arises from somathing rather mysterious called "head load." Unlike Tandon drives, the TEAC units contain a small solenoid that holds the head away from the disk surface until a read or write is required. Since some copy-protection schemes involve changing the gap between disk sectors and thus rely on precise timing to determine where the irregular sactors are, the minute amount of extra time taken by the head load solenoid may cause the drive to ba unable to find one or more sectors on the disk.

There is a solution, howevar. On the top of the bare drive, at the left rear, is the head load solenoid. Through a linkage, it activates a black metal rod that holds the head away from the disk surface.

There is a small set scraw in the linkaga. With a 1.5 mm Allen wranch you can remove this set screw; as a result tha head will be in constant contact with the disk surface. Onca this adjustment is made, the problems with copy-protected software should disappear.

*LET US KNOW what your experiences are with half-height drives.*

If you are not confident enough to make the adjustment yourself, the firm that sold you the driva should be willing to do it. You may want to ask about the head load setting before purchasing the drive.

The above modification worked well for me. The information above was gleaned from several phone calls to the disk drive supplier and a software house. I found that both firms—Apparat for the drives, and Norell Data for software—were very courteus and helpful.

Robert T. McCrory
Clackamas, Oregon

Although we hove not tried this technique ourselves, our local computer store assures us thot the technique is volid. Let us know whot your experiences ore with holf-height drives.

### Keep Time to the Sound of Silence

A challenge foced by oll programmers is portobility of their code ond consistent operation on all hordwore. We hope thot this technique ond others like it forever


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loy to rest the "FOR X = 1 TO 5000: NEXT X" school of time deloys.

In interactive programs it is often desirable to provide a controlled wait period. This may be done in IBM BASICA by use of the SOUND command. The normal form of that commend is SOUND F, N where F is the frequency in Hertz and N is the emission period in terms of the number of clock pulses. The pulses occur et a rate of 18.2 pulses per second. If F is 32767, no sound is emitted.

After executing this statement, the program will continue until another SOUND command is encountered; then it will wait for completion of the first SOUND command.

An example of a two second pause is shown in Figure 2.

```
N = 2 * 18.2     REM duration
SOUND 32767,N REM initiate
wait state
SOUND 32767,1 REM wait here
```

Wayne Jewett
Lorton, Virginia

### Remarkable REM

This technique works os odvertised. It's o good bug-cotcher for those heavy-duty programs you're writing.

Adding a dummy REM statement at the end of a BASIC program can help both in locating invalid line references and in deleting blocks of code. Try this simple example:

```
10 PI = 3.14
20 REM Loop to get and print
   area.
30 INPUT R
40 PRINT "Area = "PI*R^2
50 GOTO 20
65529 REM
```

*IT IS EASY to inadvertently delete a line referenced elsewhere in the program.*

In the heat of editing a large program, it is eesy to inadvertently delete a line referenced by a GOTO or GOSUB elsewhere in the program. For example, delete line 20. In doing so, you have created a dead-end reference in line 50. But there's an easy way to check for this. Just run:

```
RENUM 65529,65529
```

*NO KEYS ARE queued up into a buffer, so a program can sense exactly when a key is pressed or released.*

This RENUM command will heve no effect on the line numbers in your program, but will list ell your invalid line references. In the above case, the following will be printed:

```
Undefined line 20 in 50
```

Having "65529 REM" as the last line of the program is also useful when deleting from mid-program to the end, since BASIC accepts DELETE 30-65529 but rejects DELETE 30-. Using this consistently will save hunting around for the last stetement in your program.

Robert W. Hill
Los Osos, California

### Overcoming the Keyboard

Here's some handy information for the BASIC programmer. PC-DOS keeps track of the NumLock, CapsLock, and Scroll-Lock key stetes by setting end resetting bits in low memory. A BASIC program may alter these bits, for example, to force entry of uppercase characters from the keyboard, or to automatically toggle the numeric keyped to be ready for either cursor control or numeric key entry.

The relevant address is at 0040:0017H, as described on page A-2 of the Technicol Reference manual. In Figure 1, lines 20 through 170 provide ways to test the state


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of CapsLock, NumLock, and ScrollLock, elong with weys to force end exit CapsLock and NumLock.

The state of the Alt, Ctrl, end the left or right shift keys may also be tested. See lines 200 through 290 in Figure 1.

Another byte et 0040:0018H (see Technicol Reference menuel, page A-3) may be tested to see if the Ins, CapsLock, NumLock, or ScrollLock keys are currently being depressed. Lines 310 to 380 in Figure 1 perform these tests.

A game progrem could move a paddle without using the INKEY$ command by applying this method to test the stetes of the left end right shifts or any of the other keys mentioned ebove. The beauty is thet no keys are queued up into e buffer, so a progrem cen sense exactly when a key is pressed or released.

Den Rollins
Glendale, California

Rollins' lost paragraph is the most importont: the here-ond-now informotion thot your program gleons from these memory locotions is criticol to reol-time operotions like gomes ond grophic control. Setting these bits yourself frees your program's users from getting dumb

*Figure 1: A program by Dan Rollins to test the state of vorious keys and to force or exit CapsLock ond NumLock.*

```
10  DEF SEG=&H40
20  REM  ** test CapsLock state:
30  IF PEEK(&H17) AND 64 THEN CLOCK=TRUE
40  REM  ** force CapsLock state:
50  POKE &H17,PEEK(&H17) OR 64
60  REM  ** exit CapsLock state:
70  POKE &H17,PEEK(&H17) AND 191
80  REM
90  REM  ** test NumLock state:
100 IF PEEK(&H17) AND 32 THEN NLOCK=TRUE
110 REM  ** force NumLook state:
120 POKE &H17,PEEK(&H17) OR 32
130 REM  ** exit NumLook state:
140 POKE &H17,PEEK(&H17) AND 223
150 REM
160 REM  ** test SorollLook state:
170 IF PEEK(&H17) AND 16 THEN SLOCK=TRUE
180 REM
190 REM
200 REM  ** test if Alt key is depressed:
210 IF PEEK(&H17) AND 8 THEN ALT=TRUE
220 REM  ** test if Ctrl key is depressed:
230 IF PEEK(&H17) AND 4 THEN CTRL=TRUE
240 REM  ** test if either shift key is depressed:
250 IF PEEK(&H17) AND 3 THEN SHFT=TRUE
260 REM  ** test if left shift key is depressed:
270 IF PEEK(&H17) AND 2 THEN LS=TRUE
280 REM  ** test if right shift key is depressed:
290 IF PEEK(&H17) AND 1 THEN RS=TRUE
300 REM
310 REM  ** test if Ins key is depressed:
320 IF PEEK(&H18) AND 128 THEN INS=TRUE
330 REM  ** test if CapsLock is depressed:
340 IF PEEK(&H18) AND 64 THEN CL=TRUE
350 REM  **  test if NumLock is depressed:
360 IF PEEK(&H18) AND 32 THEN NL=TRUE
370 REM  ** test if ScrollLock is depressed:
380 IF PEEK(&H18) AND 16 THEN SL=TRUE
```

instructions like, "Make sure you have pressed the NumLock key."

**STRIGger Happy**

This contributor also goes beyond the BASIC manual and into the depths of the Technical Reference manual to explain just how much freedom you have with joysticks and button inputs to the PC.

The Technical Reference manual's description of the Game Control Adapter states (on page 2-117) that the board will support up to four switches. These switches are the buttons on most joysticks. However, when the BASIC manual describes the STRIG function, it only refers to the use of two of these buttons, labeled A and B.

***THE GAME Control Adapter board will support up to four switches.***

STRIG(0) is true if button A has been pressed since the last time the channel was sampled. STRIG(1) is true if button A is currently being pressed. STRIG(2) and STRIG(3) are analogous to 0 and 1, except that they apply to button B.

Two other buttons, I'll call them C and D, are supported by BASIC but are not described in the BASIC manual. STRIG(4) and STRIG(5) apply to button C, and STRIG(6) and STRIG(7) apply to button D. (Those of you with the T&G Products joystick should note that its buttons are addressed as A and C.)

The BASIC manual also describes the "ON STRIG(n) GOSUB line" command as supporting only buttons A and B by using "n" equal to 0 and 2. However, by using "ON STRIG(4)" and "ON STRIG(6)", buttons C and D may also be used.

Brian D. Mann
Richmond, Virginia

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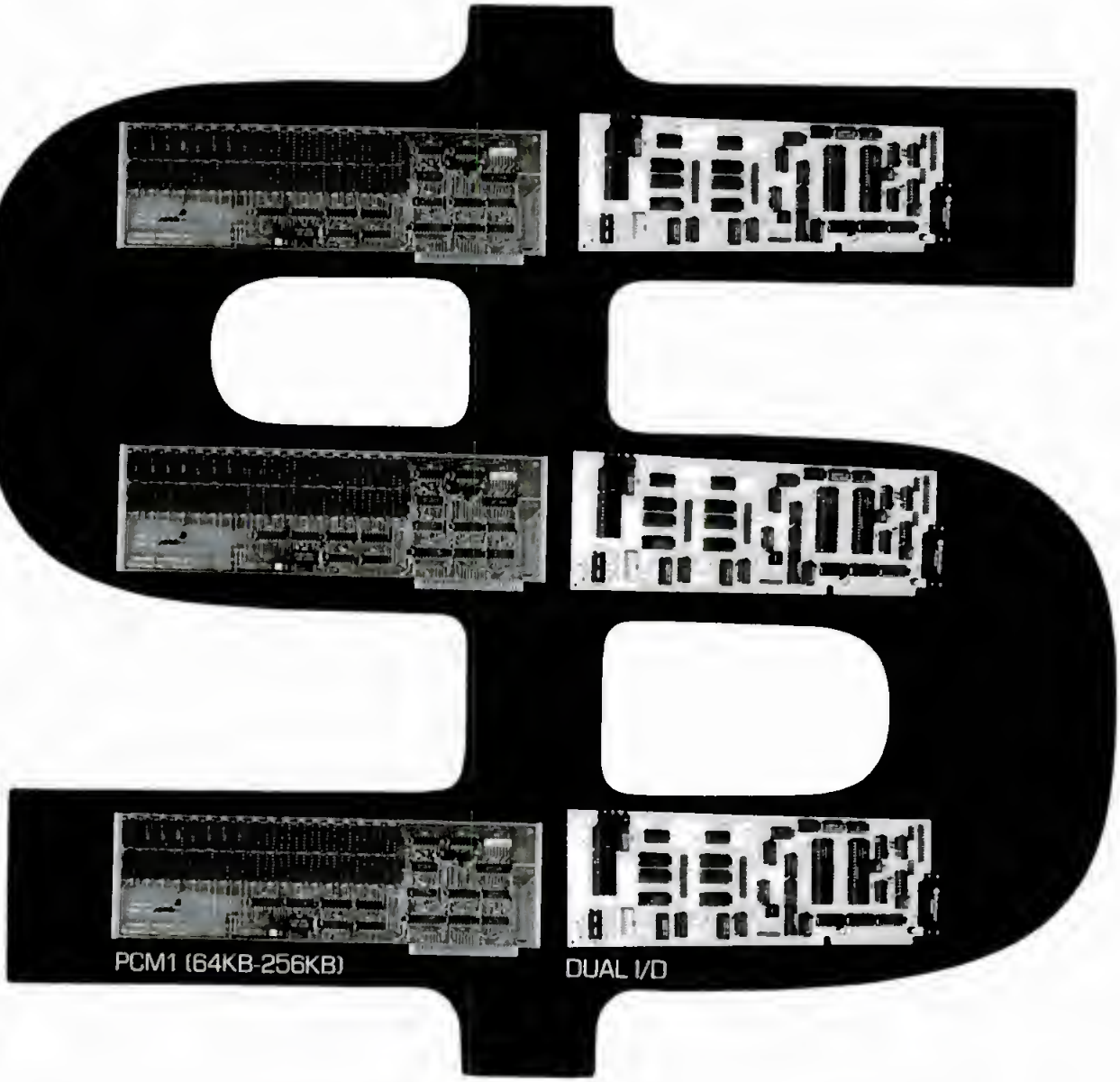
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PERSPECTIVE/WILL FASTIE

*The IBM PC has had a wild ride on the business graphics boom. But has it missed the boat for the multi-terminal office market?*

# The Graphical PC

By now everyone knows that business grephics are booming. The phenomenon is largely due to personal computers, which have driven tha cost of automated graphics production so low that businesses of eny size can afford them. Even color plotters, heretofora terribly expensive, can be had for $900 to $1,600.

The IBM PC cama into being just et tha momant the graphics boom became evident. Initielly, IBM's support of graphics was limited to the color/graphics edepter; no monitor device or printer cepable of displaying graphical imeges was availeble from Big Blua. In the iast faw months IBM announced both en upgrade to the printer for dot graphics and the IBM color display; both increese the mechine's utility as e graphics work station.

Even with these new davices, the PC is not "whole" as a graphics work station. There is very limited software support from IBM (with PC-DOS 2.0, a graphics screen now can be dumped to the printer), and serious plotting applications require hardware from another source. The number of grephics epplication packages from third parties is growing rapidly; et tha moment, the better ones saam complicated to use and expensiva to buy. Furthermore, the hardware requirements of these packages mey be in conflict with those of other peckeges used on the mechine, especielly the integrated programs. This complicates tha configuration not to mantion driving up its prica.

*IBM WAS very wise to make text presentation compatible from adapter to adapter.*

Perhaps tha worst problam has to do with tha choica IBM made in the originel design of its display adapters. A buyar's configuration dacision is mada difficult by the perceived need to choose between the monochroma display edeptar and the color/graphics adapter, a decision aggravated by the absanca of a printer port on the letter. Both adeptars can be purchased for e reletively smell premium, but thet implies using two displays as weli, at considerabla edditional expanse. This decision can be very difficult because tha IBM monochrome displey is ebsolutely beautiful for text and wonderfully aesy on the eyes, but is limited to simple character graphics. Text quality on displays connected to the color/graphics edepter—even good ones like the IBM, the Princeton, end others—is et best of medium quelity end is conducive to eyestrein over the long haul.

And therein lies the mein problem. The high quelity of the IBM monochrome displey is echieved through the use of e higher, end therefore different, resolution than thet provided on the color/graphics adepter. The monochrome resolution is 720 dots ecross and 350 dots down, as opposad to a resolution of 640 by 200 for the color board. In terms of totel dots, the monochrome board delivers twice tha resolution of the color board.

This choice had to be meda so that the color board could provide a resolution

eppropriate for use with television sets. The desire to be compatible with all types of display led IBM into this corner, and it's not clear how it will get out. One solution is to add 640 by 200 graphics onboard the monochrome board, so that a graphics capability is present. However, IBM was very wise to maka text presentation compatible from adapter to adapter, and similar compatibility for graphics leads to problems of image size and espect ratio.

IBM was very wise not to have built two different graphics tachnologies, one for color and one for monochrome. That suraly would hava confused the issue beyond reason, and mada the lives of software developers even more miserable.

***TWO products provide both color and monochrome capability on a single board.***

For those with clear requiremants for graphics, the color/graphics adapter is the obvious choice, albeit one which requires the edditionel purchase of a printer board. A number of othar vendors, however, offer color/graphics boerds for the PC with a variety of interesting characteristics.

The simplest of the lot is the Colorplus board, from Frederick Electronics (Plantronics). The price of the board has dropped to $475 from an original price of $750, making it more competitive with tha IBM adaptar. Tha product offers e complataly IBM-compatible color/graphics interface, a second plane of memory that doubles tha number of colors (four colors in high resolution and 16 in madium), and an integrated printer port. IBM's price for color and a printer port is $394, so the Colorplus product is quite interesting.

Two companies offer products (neither seen by this writer as yet) that provide both color end monochrome cepebility on a single board. The indafatigable Tecmar offers the Graphics Master, which appears to drive just about any display end allows video images and computer-generated graphics (or legands) to be mixad. USI Computer Products offers the MultiDisplay Card which has color, monochroma, and printer adapters; this board also has twica the mamory capacity of the IBM color/graphics adapter.

At l ast two other companies, Orchid Technology and Hercules, have products that allow graphics to be displayed on the IBM monochrome display. Both have resolutions that match the display, about 720 by 350. The Hercules graphics card can replace the IBM monochrome adapter, while the Orchid card requires a second slot and attaches to the IBM adapter.

Confused? You should be. The bottom line is software: buy a board only if you know your programs cen support the particular graphics adapter, or if the software you want requires a particular device. And make sure the device is IBM-compatibla for the rest of your software.

### XT Puzzles

I complained about PC versus XT confusion last time. It seems IBM, at least through my local product center, has decided to call the original "PC1." Aha! One of my guesses, don't you know. Stay tuned to this channel, atc.

Meenwhila, PC1 really isn't anymore. After the XT was announced—but not in time for us to find out for tha last issue—IBM announced a slightly revised version of the PC. This "new" PC has 64K of RAM installed on a system board which can be upgradad to 256K! Ahe! I guessed wrong! So much for punditry. Tha naw PC (do wa call this PC'?) is a 5-slot affair, not the 8-slot motherboard I pradicted.

***MICROSOFT held a seminar at which it described Xenix, its commercialized version of Unix.***

(I just saw an ad for a memory board with 256K on it for $295! Thare really is trouble in the aftermerket now, folks, but it's to our advantage.)

And finally, the brackets et the end of IBM edepter cards have chenged for the XT model. These brackets fit in the standard PC. Moreover, the PC bracket can fit in the XT, although it's a tight squaeza.

## Product Information

*The following graphics adapters and their manufacturers are mentioned in this column.*

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Frederick Electronics (Plantronics)
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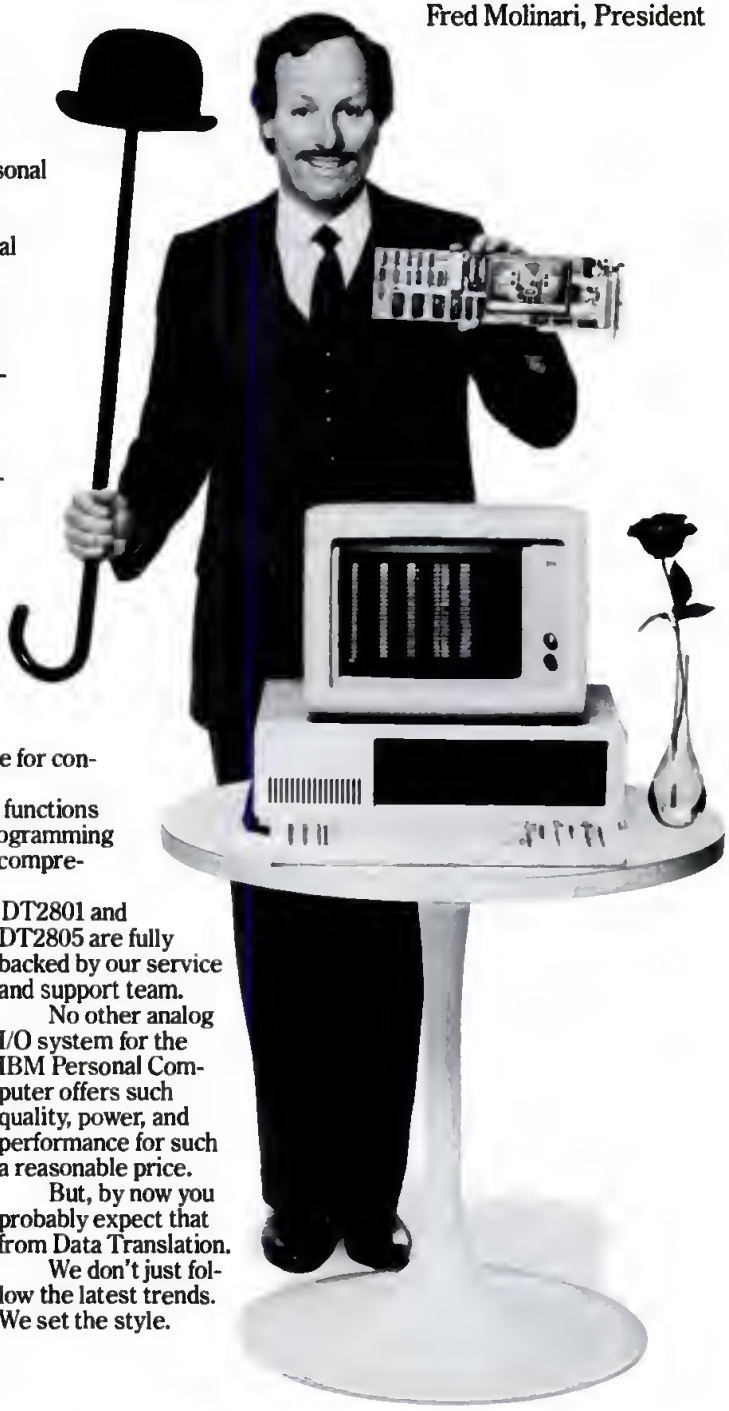
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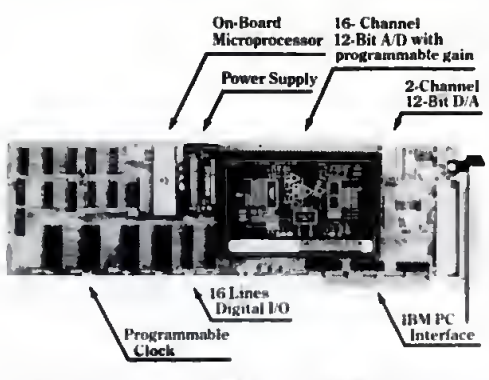
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### Smooth Operators

Microsoft held e seminer for the press recently, at which it described Xenix, its commercielized version of Unix. It is elmost finished with revision 3, which should be eveileble to its OEMs in June. A number of systems (PC's, Radio Sheck, DEC, Victor, and Apple Lise) were on dispiey, all running Xenix. Redio Shack was running its alreedy-released version end three machines were networked.

I was not overly excited by this news, since most of us have been expecting Xenix to pop up for some time. There were three things ebout the seminar thet really caught my attention.

The first was Microsoft's discussion of the "visual shell," its name for e program thet sits between e user and the guts of the operating system. It ellows a user to operate the system by pointing at things rather then spelling them out. This shell will be ready in June for both Xenix end MS-DOS 2.0 (translation: PC-DOS 2.0). That's imporiant, and we should all be waiting to see what IBM does about this and how quickly the shell becomes eveileble for the PC. My guess: IBM will announce the shell as en edd-on product to PC-DOS 2.0, eveilable at edditional cost. Assuming $40, PC-DOS 2.0 with the shell would be a $100 product.

Second, Jon Shirley, Vice President of Tendy's Computer Division, waxed enthusiastic about Xenix for the TRS-80 Model 16 during his presentation. He told the story of how Tandy was tempted into the land of evil, nonstendard, proprietary opereting systems, but wes seved by the divine hand of Bill Gates.

*IBM IS NOT in a position with the PC to effectively address the multi-terminal market.*

I give the man credit: his switch to Xenix on short notice took guts, and it eppears to heve been successful. Although Jon would not give out specific numbers, Jeen Yetes told me that about 30,000 Model 16's heve been installed, of which about 5,000 run Xenix. Very impressive. Jon did say that he thought every Model 16 running Xenix was multi-user, since the terminel cost wes smell compered to the totel Model 16 price. I mention ell this beceuse IBM is not in e position with the PC to effectively address the multi-terminal market; I'm not sure the performance of the 8088 is up to it anywey. This gives Redio Shack a tremendous edvantage over IBM in the small business merket.

Third, end finally, the seminer was somewhat ragged around the edges. The demonstrations were not particularly exciting, nor were they effective in getting Microsoft's important points ecross. Attendance was light, something I attributed to the very lete notice; I was invited on a Thursday for the next Tuesday. Most of the non-Microsoft speakers allowed that they had been recruited on very short notice. Esther Dyson (editor of the Rosen Electronics Newsletter) triggered the thought: Why did Microsoft hold the seminer? Was it e response to something, or an ettempt to steel someone's thunder?

Time will tell. */PC*


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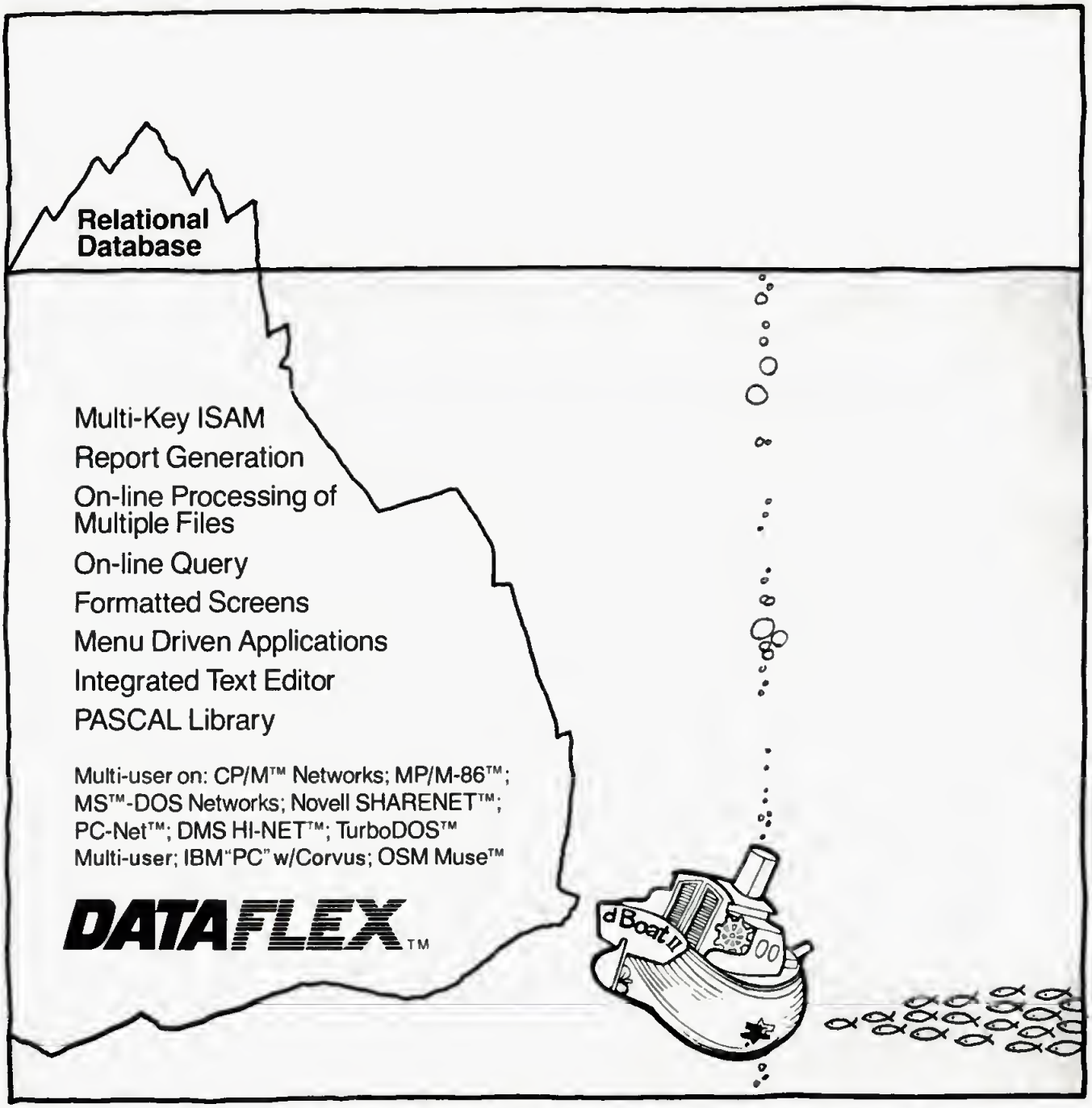
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Technical Review
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I interviewed him to find out more about *Quikpro + Plus* and pass this valuable information to you. He told me "The best part of this software is that it gives you a separate custom program every time you use it. The resulting program is produced, error-free, in BASIC (Microsoft Basic/MBasic/Basic 80/Oasis Basic, as appropriate to your system) for you by *Quikpro + Plus*. What's more, you can list your new program, look at it, see what makes it tick, and modify it as you wish."

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BOOK EXCERPT/MITCHELL WAITE AND CHRISTOPHER L. MORGAN

# IBM PC GRAPHICS PRIMER, PART II

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In Part I of the IBM PC Graphics Primer, authors Christopher L. Morgan and Mitchell Waite described the PC color/graphics and monochrome adapters, explained medium and high resolution color modes, and introduced plotting and drawing commands in Advanced BASIC. In Part II, they explore these applications further, providing sample programs to generate colorful screen graphics.

This chapter describes how to use the point, line, and circle plotting commands Pset, Preset, Line, and Circle, for simple to sophisticated applications. As opposed to Chapter 1, in which these commands were introducad in black and white in their simplest forms, this chapter presents these commands in the full glory of color with all their available options. Although the "syntax" (format) of the four commands is simple enough, their variety of uses in applications is enormous. Thus, in order to prevent "overwhelm," we will start with some simple exemples and build toward the more complex ones.

Once e firm grip of these ideas has been esteblished, we will accelerate to more edvenced uses of plot, line, and circle, concluding with pie and bar charts, and 2-D and 3-D graphs. For the grand conclusion, we present a program that draws a three-dimensional view of an object using deta statements to dafine the picture. The progrem even hides those lines that should be hidden. In our case, we heve

chosen to display a house, but you can use this same program to display many other 3-D objects with hidden lines. You will only have to change the data.

### The Commands

As we explain these graphics commands we will be showing a series of stand-alone example program segments. By stond-olone, we mean that although all of these examples are part of one big program, each segment can really be run by itself provided your machine is properly initiafized.

***THE LOCATE command is extremely useful in graphics.***

As we come to each example, we will give a small section of BASIC statements for you to type in. You should just add these to what you have already typed from the previous examples in this chapter. Please don't change any of the line numbers because we have designed each sample program so that it wifl not overlap with any other. As you work your way through the examples you will make a longer and longer program. ff you wish to see the results from the beginning of the chapter up through the point where you are now, just type RUN. However, if you wish to see what you are working on at the moment, type GOTO followed by the line number at the beginning of that example. This last method will start the computer at the beginning of that particular example.

When you are finished studying this section and have entered all the examples, you will be able to RUN the program from start to end (by typing RUN) and see the results of all the examples in a kind of flash card review of what you have learned in this chapter.

Our first example is a program that you should use to set your machine up for the following examples in this section. ft will also be used for the same purpose in following chapters. This short initialization program will form the first several fines of our program.

This short program puts the fBM PC into the medium resolution mode, sets the background color to light red, and selects palette 1. ft also turns off the function key display at the bottom of the screen and makes sure the screen is cleared.

***WHEN YOU are finished studying this section you will be able to RUN the program from start to end and see the results in a kind of flash card review.***

```
130 REM INITIALIZATION
140 REM Put the IBM in medium
150 REM resolution with
    color.
160 REM
170 REM The background color
    is
180 REM light red and the
190 REM foreground colors are
200 REM chosen from palette 1
210 REM
220   SCREEN 1
230   COLOR 12, 1
240 REM
250 REM Clear the screen with
    keys off
260 REM
270   KEY OFF
280   CLS
```

Type it in and try it out. You should see a blank light red screen.

Our second example helps connect the sample program sections. ft consists of a couple of subroutines. The first subroutine stops, asks you to press the Enter key if you wish to continue. It also calls another subroutine that puts a centered title on the top of the screen.

```
5000 REM SUBROUTINE - PAUSE &
     TITLE PAGE
5010 REM
5020   LOCATE 25,1
5030   INPUT "Press ENTER to
       continue";A
5040   CLS
5050   GOSUB 5080
       REM centered title
5060   RETURN
5070 REM
5080 REM SUBROUTINE -
     CENTERED TITLE
5090 REM
5100   LOCATE
       1,(40-LEN(T$))/2+1
5110   PRINT T$;
5120   RETURN
5130 REM
300   T$ = "RED BACKGROUND"
310   GOSUB 5080 REM centered
      title
320 REM
```

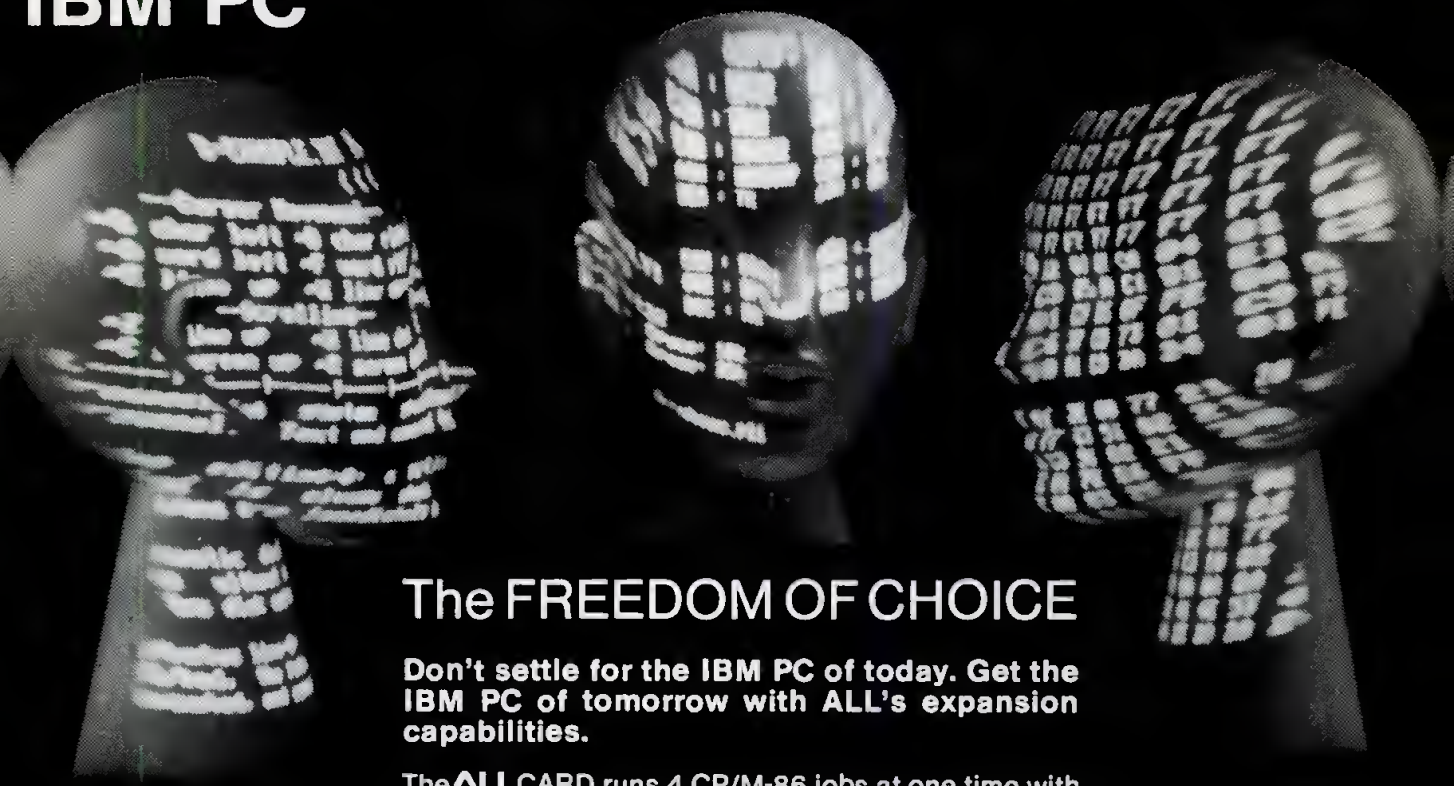
Why don't you type all of this in it now. Please don't remove the statements you already typed in from the first sample.

Now run your program. You should get a red screen titled RED BACKGROUND. How is this for speciaf effects?

Notice that the Locate command is used a couple of times. Although, strictly speaking, it is not a graphics command, it is extremely useful in graphics. This command positions an unseen "text cursor" to a specified row and column. This allows you to start printing text anywhere you want on the screen. Contrary to the usual procedure for graphics, *row* (y-position) comes before column (x-position) in this command. This is more natural for text (that is, line, column = y,x). Notice that the first Locate is used to put the message "Press Enter to continue" on the twenty-fifth row (line) of text. For this to work, you must turn off the display of function keys on the twenty-fifth line with the Key Off command (as you did in line 270 of the program). The second use of the Locate command is for centering a title contained in the string T$. Here, the correct column to begin printing is computed by using the length of the string T$ that contains the message. This computation is found within the Locate statement: You can use ao expression for the row or column.

You might wonder why we have chosen to divide such simple work into two subroutines; surely one could do both functions. In the good old days of FORTRAN programming, there would have been one subroutine with two "entry" points; the second would be used if you just wanted to center the title. This is frowned upon now in the modern days of structured programming. Languages like

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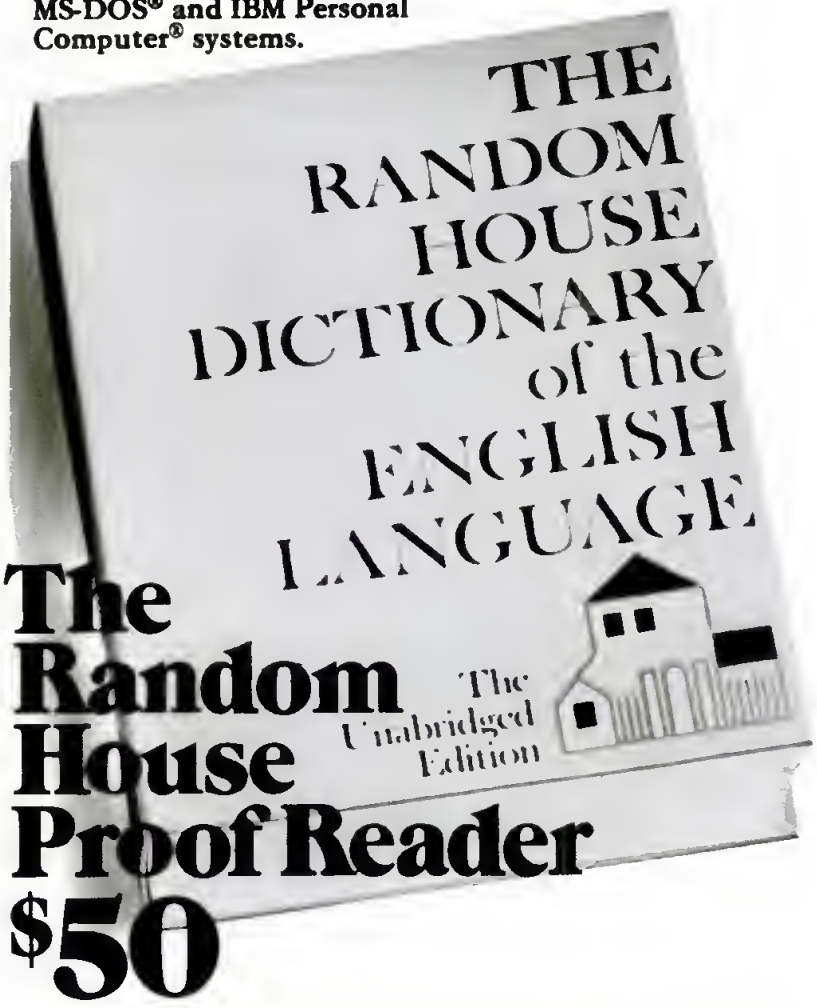
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even though the resulting programs may run slower because of the extra overhead of all the extra calls (GOSUBs). That is, GOSUBs take time to execute, and having more of them makes your program run slightly longer, but this loss of performance is outweighed by gains in speed of development and maintenance of programs. In light of this, we will try to structure our programs, even in "anything goes" BASIC. So on to the commands for plotting points.

### Pset and Preset

Pset and Preset ara both used to plot points. Sinca every picture is made of points, it is possible to do all your graphics with these two commands. This is highly inafficient for a number of reasons. The most obvious reasons are speed of execution (how fast your program runs) and size of program (how much memory and/or paper it takes up). Equally important are speed of davalopment (how long it takes to write your program) and ease of maintenance (how easy is it for you or somebody else to understand and modify your program). The version of BASIC you are using has soma of the most powerful graphics commands available.

Now let's get down to details. The syntax (correct form) of the Pset and Preset commands is as follows:

```
PSET (x,y) [,color]
PRESET (x,y) [,color]
```

where (x,y) indicates the coordinates of the point and color specifies the color.

If tha color is not specified (default color moda), Pset plots a point whose color is the foreground color and Preset plots a point whose color is the background color. In general, on a claar screen (background color scraen), you use Psat to plot plots and Preset to erase points.

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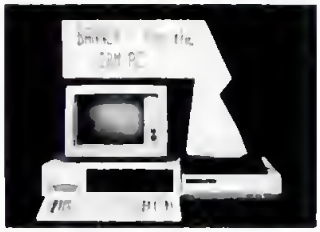


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The square brackets indicate that the color is optional. In fact, if the color is specified, Pset and Preset perform identically! That is, they both plot a point of the indicated color. Note that the square brackets include the comma that normally separates the color specification from the rest of the command. If you do not specify the color, then you'd better not type in this comma. (Otherwise, the computer will reach out and slap your hand.)

In the 320×200 medium resolution mode, at any one time there may be four colors, indicated by the numbers 0, 1, 2, and 3. These are what is called *logical* colors. That is, how they "map" to actual colors depends upon other commands, namely the Color command, which was discussed in PC, Volume 1 Number 12.

The number 0 indicates the background color, and the number 3 the foreground color. The background color can be one of 16 possible colors and there are two palettes for colors 1, 2, and 3. In our examples we will use the Color statement to obtain different background and palette colors in the medium resolution mode.

In the 640×200 high resolution mode, there are two colors. These are specified by the numbers 0 and 1. The number 0 indicates the background color, which is always black; the number 1 indicates the foreground color, which is white. (On some monochrome screens, the foreground color will appear green or amber.) To further complicate the issue, in the high resolution mode, the number 2 acts the same as a 0, and a 3 acts the same as a 1. Thus, in this mode the background color is produced by both 0 and 2 and the foreground by both 1 and 3. All of this means that if the color is not specified, then the Pset and Preset commands will behave as shown in Figure 1.

| resolution | command with color not specified | equivalent commands when color is specified |
|---|---|---|
| medium | PRESET (x,y) | PSET (x,y),0 or PRESET (x,y),0 |
| medium | PSET (x,y) | PSET (x,y),3 or PRESET (x,y),3 |
| high | PRESET (x,y) | PSET (x,y),0 or PRESET (x,y),0 |
| high | PSET (x,y) | PSET (x,y),1 or PRESET (x,y),1 |

*Figure 1: Default colors for Pset and Preset.*

Having explained what happens with the color of a point, let's discuss how a point is positioned on the screen—the (x,y) part. Coordinates are used to specify the location of points on the screen. The point (0,0) is at the top left corner. The x-values range from 0 to 319 or from 0 to 639, depending upon the resolution, and the y-values range from 0 to 199.

Coordinates can be specified in two different ways: absolute and relative. With the absolute mode, you give the actual screen coordinates of the point to be plotted, but with relative coordinates you give a change in coordinates. BASIC keeps track of a kind of unseen "graphic cursor" called the "current position." Each time a Pset, Preset, Line, or Circle command is employed, the current position is updated with the new position. With the Pset or Preset commands, the current position is updated to the point that you are plotting. More precisely, with a Pset or Preset command, coordinates in absolute mode become the coordinates of the new current position, and a point is plotted there. In contrast to this, coordinates in relative mode are added to the current position, giving the new current position, which is then plotted.

You can recognize the difference between absolute and relative coordinates by looking for the key word STEP just

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before the coordinates in the command line. If it's there, then you are using relative coordinates; otherwise, you are using ebsolute coordinetes.

Both of the Pset and Preset commands will plot a point. Whether it's seen or not depends upon its color and the color of the surrounding points. It is interesting to note thet there is no simple command, such as Move, that just updetes the current position.

For an example of how to use the point plotting commands, take a look at the program below.

This short program plots a cross of points in the center of the screen, using both absolute and relative coordinates and Pset end Preset commends.

```
330 REM POINTS ON THE SCREEN
340 REM
350   T$ = "POINTS ON THE
      SCREEN"
360   GOSUB 5000 REM pause
      & title
380   PRESET (159,100)
390   FOR I = 1 TO 10
400     PSET STEP(4,0)
410   NEXT I
420   REM
430   PRESET (159,100)
440   FOR I = 1 TO 10
450   PSET STEP(-4,0)
460   NEXT I
470   REM
480   PRESET (159,100)
490   FOR I = 1 TO 10
500   PSET STEP(0,4)
510   NEXT I
520   REM
530   PRESET (159,100)
540   FOR I = 1 TO 10
550     PSET STEP(0,-4)
560   NEXT I
570 REM
```

When this example runs, you will see a number of points plotted forming the pattern of a cross. You cannot see the center point of the cross because it is the same color es the beckground.

Notice how we invoke our "peuse & title" subroutine at the beginning of the program segment. You can see that the line that defines T$ (line 350) can serve as documentation for this segment!

Now look at the graphics commands. The first command is a Preset (line 380). Since there is no Step, the coordinates are in absolute mode. Thus, it will plot a point at (159,100), that is, a point whose x-coordinate is 159 and whose y-coordinate is 100 (x-coordinate elweys comes first with graphics commends). Since the Preset command plots a point whose color is the beckground color and since the point (159,100) already is the background color, you will not see this point. Consequently,

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the main purpose of this command is to set the current position. The IBM PC "default value" for the current position is (160,100), but do not normally count on this defeult position; it is only good right after you have cleared the screen.

You see thet efter the first graphics command, the current position is (159,100). Next you have e FOR loop that runs the Pset command ten times. This Pset (line 400) has a STEP before the coordinates and thus is in relative mode. Adding its coordinates (4,0) to the current position (159,100) gives a new current position of (163,100). Since this is the foreground-producing Pset command, you will see the point as e white dot on the screen. It appears white because we have chosen palette number one in the Color statement (foreground is white). Each time around the FOR loop, the Pset commend moves the point by the seme emount. You see a total of ten dots equally spaced to the right of the center point of the screen. They ere all white because we use the seme Pset command eech time. Following this FOR loop are three more FOR loops, which draw the other arms of the cross.

It is interesting to note thet if the defeult position of (160,100) were used insteed of our Preset position (159,100), the white dots wouid be very hard to see without using an RGB color monitor. We have seen that with a red background, white dots should be drawn only on odd-numbered x-coordinates. This is why we start with en odd number, 169, and increment or decrement by an even number, namely 4. This way we get x-coordinates 159, 163, 167, and so on (moving to the right) or 159, 155, 151, and so on (moving to the left).

Relative coordinates are sometlmes handy if you have a certain shape such as a marker, icon, or machine part that you wish to place at various spots on the screen, or if you want to "vector" along the boundary of a figure. For example, if you ere trying to draw a room, it is often easiest to deal with the length and direction of each wall than it is to deal with their absolute coordinates because the "algorithm" for actually meesuring a room consists of meesuring the length of each wall and noting its direction.

In the next subsection you will extend your grephics cepebilities to drewing lines. Commands to drew lines ere much more plentiful in graphics programs than commends to plot points. While we discuss lines we will also see more examples of the various forms of the point plotting commands.

### Line

As indicated by its name, the Line command is used to draw lines, but it is ectually useful for much more than that. In this

***RELATIVE coordinates are sometimes handy if you have a certain shape that you wish to place at various spots on the screen.***

section we will show how to use it to draw unfilled and filled boxes. We will continue to use our short stand-alone program sections to build in stepwise fashion confidence end knowledge about the effective use of this commend. The full syntax for the LINE command is:

```
LINE [(x1,y1)] - (x2,y2)
[,[color] [,B[F]]]
```

Look at all those square breckets! They all indicete various levels of options. Let's start with one of the simplest cases:

```
LINE (x1,y1) - (x2,y2)
```

Here (x1, y1) are the coordinates of the beginning point of the line and (x2,y2) are the coordinetes of the end point of the line. That is, this command will cause e line to be drawn from (x1,y1) to (x2,y2).

The color is not specified. In this case it will use the foreground color just as described above for the Pset command. That is, we will see color 3 if in medium resolution and color 1 if in high resolution. In the medium resolution mode, color 3 can be either white or yellow depending upon the palette number that is set in the Color command.

Both sets of coordinates for Line can be expressed in either absolute or relative (STEP) mode.

The example below illustretes this simple form of Line commend. Notice that this example sizes up the screen by using up the full range of values for x and y in the medium resoiution mode.

This short program draws diegonal lines ecross the screen using the simple form of the LINE command in which both end points are specified.

```
590 REM LINES ACROSS THE
    SCREEN
600 REM
610   T$ = "LINES ACROSS THE
    SCREEN"
620   GOSUB 3580 :REM pause
    & title
630 REM
640 REM Draw some lines
    across the screen
650 REM
660   LINE (0,0) -(319,199)
670   LINE (0,199)-(319,0)
680   LINE (0,100)-(319,100)
690   LINE (160,0)-(160,199)
```

When you run this exemple you will see four lines that run ell the wey across the screen in different directions: two diagonelly, one horizontally, end one vertically. If you are using an NTSC monitor or TV you may have difficulty seeing the vertical line beceuse its color is white and it lies entirely on even-numbered pixels.

*COMMANDS TO draw lines are much more plentiful in graphics programs than commands to plot points.*

The next three exampies of the Line command have no pauses between them. They will all appear in one picture.

First, however, edd some color to your syntax for the Line commend:

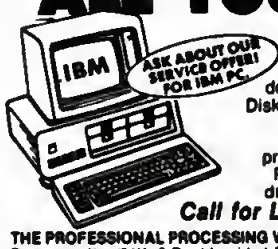
```
LINE (x1,y1) - (x2,y2), color
```

Here, color can be a number from 0 to 3 following the rules described above the Pset (and Preset) command(s). It is better to relate the Line command to the Pset commands as both of them heve the same defeult behavior with regard to color. The next example shows how to draw e rectangle with this form of the Line command.

This program draws a rectangle in which each side is a different color, using the Line command.

```
720 REM RECTANGLES
```


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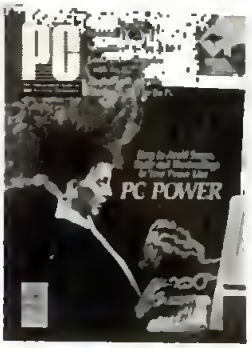
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611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 636 639 64
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```
730 REM
740   T$ = "RECTANGLES"
750   GOSUB 3580 :REM pause
      & title
760 REM
770 REM FIRST THE HARD WAY
780 REM
790 REM This is a sequence of
      four lines.
800 REM
810   LINE (51,50)-(101,50),
      0
820   LINE      (101,50)      -
      (101,150), 1
830   LINE      (101,150)     -
      (51,150) , 2
840   LINE (51,150)-(51,50),
      3
850 REM
```

When this program runs, you will see a rectangle appear on the left third of your screen. Each side of the rectangle is a different color. Notice that the first side is not visible because it is the same color as the background. Absolute coordinates are used each time the Line command is used.

Now let's explore bow to use the Line command witb only the second set of coordinates specified. This uses the idea of current position, which was introduced in the discussion of Pset and Preset earlier. The syntax for this form is:

***THE LINE command to the Pset commands has the same default behavior with regard to color.***

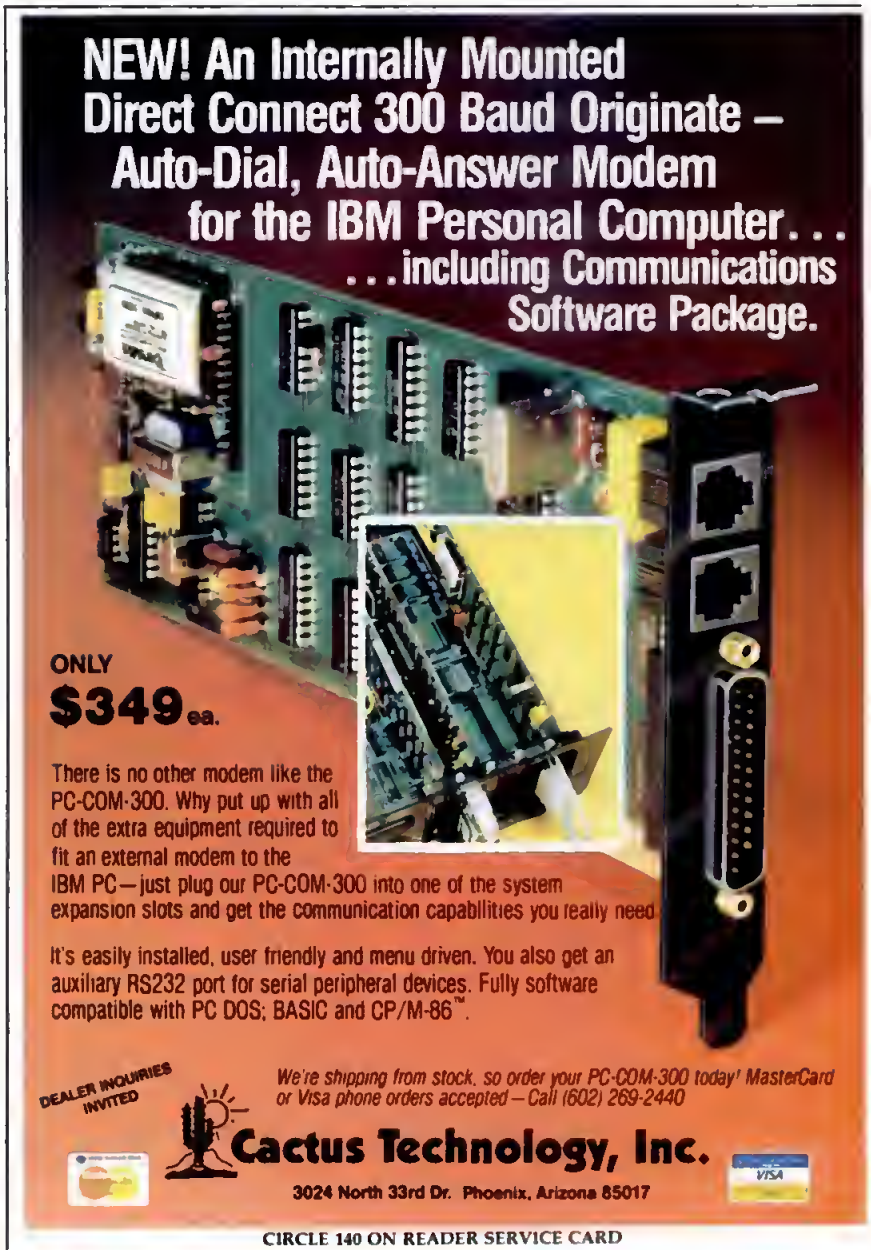
```
LINE - (x2,y2) [,color]
```

As you can see, the color is optional. Tbis command causes a line to be drawn from the current position to the point specified by the coordinates (x2,y2). The current position is updated to the end of the line (coordinates (x2,y2)). The current position is always updated in this way whatever form of the Line command is used.

Either absolute or relative coordinates can be used. In the next couple of examples, we will continue to use absolute coordinates, but later we will use relative coordinates. Again, the difference between these modes is indicated by the presence or absence of the keyword: Step. In the following example, you will marcb around the rectangle using absolute coordinates (no Step), providing only the new current position eacb time. Notice that the Pset command is used to set the current position before the Line commands start drawing the sides.

This program draws a rectangle using current position and the form of the Line command in which the first pair of coordinates is omitted.

```
860 REM AN EASIER WAY
870 REM
880 REM This is a sequence of
      four lines
890 REM using the current
      position.
900 REM
910   PSET - (151,50)
920   LINE - (201,50), 1
930   LINE - (201,150), 2
940   LINE - (151,150), 3
```

CIRCLE 140 ON READER SERVICE CARD

```
950   LINE - (151,50), 2
960 REM
```

Now let's see how to draw a rectengle with only one graphics commend. This uses the Box option of the Line command. The syntax is:

```
LINE [(x1,y1)] -
(x2,y2),[color],B
```

This draws a rectangle whose sides are parallel to the sides of the screen and whose x values ere between the x-coordinetes x1 and x2 and whose y vaiues are between y-coordinates y1 and y2. As you can see, the first coordinate and the color are optional—they are in brackets. If the first coordinates are not specified, the current position will be used instead. If the color is not specified, the foreground color will be used.

Now, let's look at the coordinates more closely. As we just saw, e rectangle whose sides are parallel to the sides of the screen can be described as a set of points (x,y) such that x is between values x1 and x2 end y is between values y1 and y2. Actually, this describes a solid box. Using a two-dimensional notion of "between," we could say instead that this box is the set of all points (x,y) that are between points (x1,y1) and (y1,y2). The rectangle is the boundary of this box, and the points (x1,y1) and (x2,y2) form a pair of opposite corners for the rectangle.

In the example that follows, we show how to draw such e rectengle in one graphics statement. Notice that both pairs of coordinetes are specified, the color is not specified (a piace is held for it by the commas), and the B is used to specify e "Box." Thus, a rectangle is drawn in the foreground color.

The following program draws a rectangle in one graphics command, using the Box option.

```
990 REM A BOX IN JUST ONE
      STATEMENT AND ONE COLOR
1000 REM
1010   LINE (251,50) -
         (301,150),, B
```

The next example shows how to use the Line command to draw lots of random rectangles quickly. The RND function is used to generate random numbers. The RND function in BASIC generates "pseudo random" numbers between 0 and 1. Thet is, it produces a sequence of numbers between 0 and 1 that "behaves" like a sequence of random numbers—even though the computer has a very definite set of rules for producing this sequence.

***PI IS ONE of those numbers that can never be totally accurately specified by a decimal (or binary) number.***

The program drews lots of rectangles randomly positioned and sized.

```
1040 REM RANDOM COLORED RECT-
       ANGLES
1050 REM
1060   T$ = "RANDOM COLORED
       RECTANGLES"
1070   GOSUB 3580 REM pause
       & title
1080 REM
1090 REM Here we use relative
1100 REM coordinates and
       random numbers.
1110 REM
1120   COLOR 0,0
1130 REM
1140   FOR I = 1 TO 50
1150     X = 250*RND :
         Y = 10+110*RND
1160     U = 70*RND :
         V = 50*RND
1170     C = 3*RND + 1
1180     LINE          (X,Y)-
         STEP(U,V),
         C, B
1190   NEXT I
1200 REM
```

Each parameter of the Line statement (line 1010 of our program) is controlled by e separate varieble thet is randomly generated. Notice that relative mode is used for


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CIRCLE 310 ON READER SERVICE CARD

tha second coordinates (x2,y2). This has the effact of controlling the width and haight, and hanca, the size of the rectangla. The variable *U* controls the width, and tha variabla V controls the height. Tha way U and V are generated with the RND function guarantees that the width will not be any greater than 70 and the height

***TRIGONOMETRIC functions are very handy in graphics.***

will not be greater than 50. This is to make sure that none of the rectangles will extend beyond the boundarias of the screen. The variables X and Y control the position of the rectangle (actually the upper left corner of the rectangle). X must be batween 0 and 250 and Y must be between 10 and 120. Each rectangle goes from (X,Y) to (X+U,Y+V). This means that the rectanglas fit within an area on the screen whose x-coordinates range between 0 and 250+70=320 and whosa y-coordinatas range between 10 and 120+50=170. Tharefore, tha full width of the screen can be filled, but the height is restricted to allow messages at the top and bottom of the screan. Notice that avan the color of the rectangle is randomly ganarated. We hava set tha background to black and selected palette 0. This makes the foreground color brown.

It is possibla to usa tha Line command to fill rectangles, too. The syntax is:

```
LINE [(xl,yl)] - (x2,y2),
[color],BF
```

Here tha letters *BF* at the end stand for Box *Fill*. You might try modifying the previous exampla so that the boxas are filled in.

Now let's change pace, and while we are at it, change the color to light blue. First we draw a single triangle. Here the number of colors matches nicaly with the number of sides—three colors for three sides. We use absolute coordinates (no Step). This "fixes" the position of the triangla. In the next axample, we will use relativa coordinates that will allow us to place the triangle anywhere we want on the screen.

This short program draws a single right triangla, using absolute coordinates.

```
1390 REM RIGHT TRIANGLES
1400 REM
1410   T$ = "RIGHT TRIAN-
       GLES"
1420   GOSUB 3580 :REM pause
       & titla
1430   COLOR 9, 1 :REM changa
       color
1440 REM
1450 REM Hare we use absolute
     coordinates
1460 REM
1470   LINE (21,100) -
       (71,0), 1
1480   LINE - (71,100), 2
1490   LINE - (21,100), 3
1500 REM
```

On the same screen let's use relative coordinates to draw a set of triangles all in a line. Notice that the (absoluta) coordinates in the Pset command are givan by expressions. This is perfectly legal and a very powerful technique. Notice also that relativa coordinates are used for the three Line statements that draw the sides of the triangla. Becausa only constants are used in thasa lina statements, the triangles all have the same siza and shape.

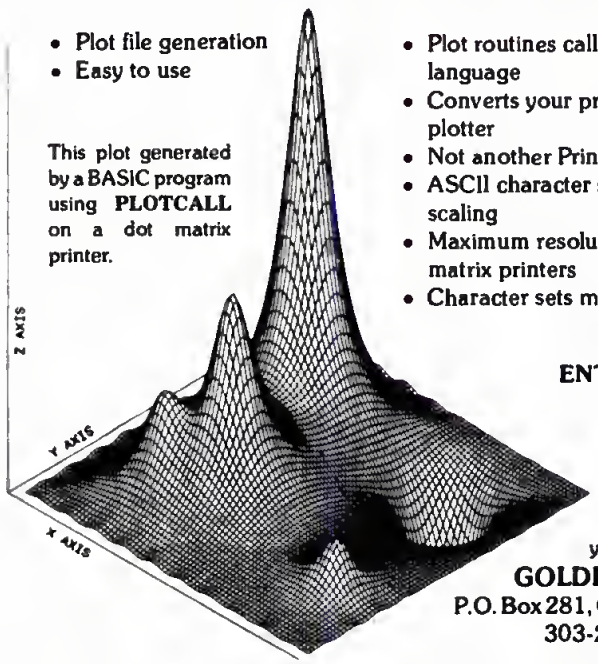
```
1510 REM Now we use relative
     coordinates
1520 REM and make lots of
     tham.
1530 REM
1540   FOR T=0 TO 100 STEP 5
1550     PSET (30+2*T,200-T)
1560     LINE -
         STEP(50,-100), 1
1570     LINE - STEP(0,100),
         2
1580     LINE - STEP(-50,0),
         3
1590   NEXT T
1600 REM
1610 REM
```

Now let's make some regular figures that eventually will lead to some circlas. Since this is a different topic, we also change the background color. This time we call for a yellow background.


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CIRCLE 247 ON READER SERVICE CARD

Write a short program that drews e regular pentegon. Solution:

```
1620 REM REGULAR POLYGONS
1630 REM
1640   T$ = "REGULAR POLY-
       GONS"
1650   GOSUB 3580 :REM pause &
       title
1660   COLOR 14, 1 :REM change
       color
1670 REM
1680 REM PENTAGON
1690 REM
1700   PI                    =
       3.141592653589793#
1710   A0 = 2*PI/5
1720   R = 45
1730 REM
1740   PRESET (60+R,100)
1750 REM
1760   FOR A = 0 TO 2*PI STEP
       A0
1770       X=R*COS
           (A):Y=R*SIN(A)
1780       LINE                -
           (60+X,100+Y)
1790   NEXT A
1800 REM
```

The program is very general and with only one change (line 1710), it will drew a regular polygon of any given number of sides. A polygon is a closed figure mede up of line segments. Triengles, squares, rectengles, trepezoids, pentagons, and hexagons are all examples of polygons.

Notice that we have defined Pi In line 1700. The # at the end indicates double precision. This much precision is entirely unnecessary, but nonetheless fun! (if you like this kind of thing). Actually, Pi is one of those numbers that can never be totally accurately specified by e decimal (or binery) number.

*A PROGRAMMER will often start with an old program and modify it so that it performs new wonders.*

The varieble AO (defined in line 1710) is the Step size for the FOR loop that draws the figure. By changing this Step size, you chenge the number of sides of the figure. Note that the Step in the FOR loop ls used differently than the key word Step that is used to indicate reletive coordinetes. In line 1720, a radius *R* is defined; It is the radius of e circumscribing circle around the polygon.

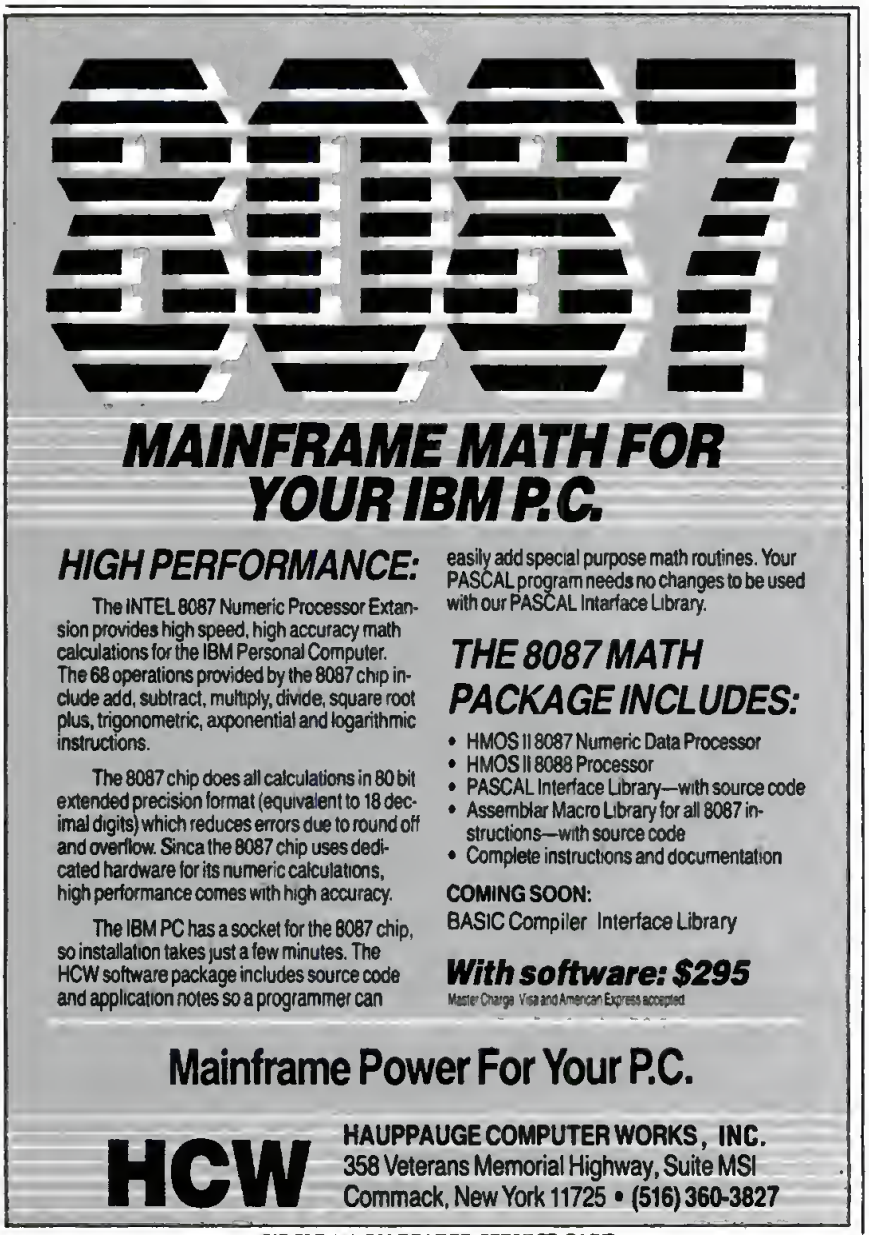
The first plotted point of the figure is set with the Preset commend on line 1740. If you don't do this, you will get an ugly line across your screen.

The FOR loop starts on line 1760. The index of the loop is A, which stands for engle. We are using radian measure, so the angle 0 is the beginning of the circle end the engle 2*PI is a complete 360 degrees around the circle. The step size has already been discussed; it determines the number of sides.

On the 1770 we use some trigonometric functions. If you are unfamiliar with or afraid of such functions, this is a good wey to get to know and love them. They become very handy in graphics. The formulas:

```
X = R*COS(A)
Y = R*SIN(A)
```

which appeer in line 1770 are quite useful. Given that (X,Y) are Cartesien coordi-

CIRCLE 258 ON READER SERVICE CARD

nates of a point on a circle whose center is at the origin, then these formulas give X and Y in terms of the radius R and the angle A (see the sample program below). The R and A are actually the polar coordinates of the point, and these formulas are actually the transformation from polar to Cartesian coordinates.

To draw the sidas we use the Lina (line 1780) command in absolute coordinates with current position. Note the coordinates are simple expressions of the X and Y variables. These expessions help placa the figure in the correct spot on the screen. Later we will discuss the topic of positioning or "mapping to the screen" in more detail. The FOR loop ends on line 1790.

The next example is almost identical to the previous ona. Only linas 1680, 1710, 1740, and 1780 are different. Why don't you List lines 1680 to 1800 on your screen and change the line numbers so that they go from 1810 to 1930? Then change your new lines 1810, 1840, 1870, and 1910 as indicated in the listing. This will cause the new figure to be drawn with six sides and in the center of the screen (* indicates changed lines).

```
*1810 REM HEXAGON
 1820 REM
 1830   PI = 3.1415926535#
*1840   A0 = 2*PI/6
 1850   R  = 45
 1860 REM
*1870   PRESET (160+R,100)
 1880 REM
 1890   FOR A = 0 TO 2*PI STEP
        A0
 1900       X=R*COS
            (A):Y=R*SIN(A)
*1910             LINE      -
            (160+X,100+Y)
 1920   NEXT A
 1930 REM
```

To get the third figure, edit your previous program and change the appropriate lines (see the sample program below). Now it is relatively easy to generate all these nearly identical program segments. It turns out that lots of programs are "grown" in a similar way. That is, a programmer will often start with an old program and modify it so that it performs new wonders. This approach actually saves quite a bit of time. Of course in real life, the resulting programs usually end up looking quite different from their ancestors (* indicates changed lines).

```
*1940 REM HEPTAGON
 1950 REM
 1960   PI = 3.1415926535#
*1970   A0 = 2*PI/7
 1980   R  = 45
 1990 REM
*2000   PRESET (260+R,100)
 2010 REM
 2020   FOR A = 0 TO 2*PI STEP
        A0
 2030       X=R*COS
            (A):Y=R*SIN(A)
*2040             LINE      -
            (260+X,100+Y)
 2050   NEXT A
 2060 REM
 2070 REM
```

## Circle

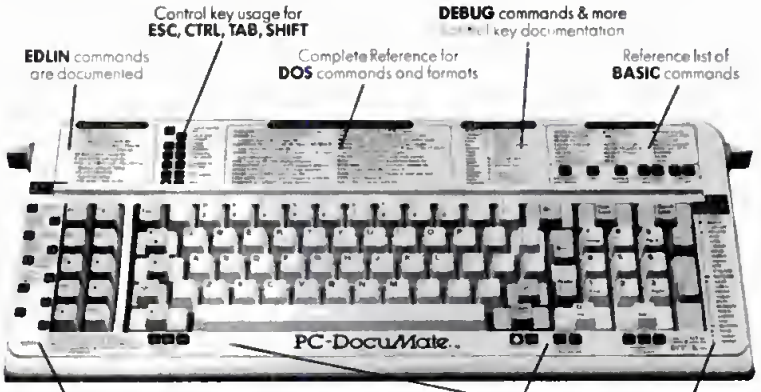
Not to run you around in circles, the Circle command actually does much more than its name implies. It also draws arcs and allipses, providing a quick way to construct curved shapes. This allows you to construct complicated pictures with less effort.


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CIRCLE 441 ON READER SERVICE CARD

The full syntax for tha CIRCLE command is:

```
CIRCLE (xcenter,ycenter),
radius[,color[,start,end
[,aspect]]]
```

Here is another place whera "overwhelm" occurs—even mora square brackats than for tha full syntax of the Line command! Let's slow down and first try to draw a plain old circle. Tha syntax for this simpler case is:

```
CIRCLE (xcenter,ycenter),radi-
us
```

where xcenter and ycenter are the x- and y-coordinatas of the centar of the circle, and radius is the radius of the circle. Here we can see that the x- and y-coordinates of the center and tha radius are all specifiad. The quantities xcenter, ycenter, and radius can all be expressions. Eithar absolute or relative coordinates can be used for tha center.

The following program sagment illustrates this form of the command. The coordinates of the center and the radius are all constants in this example. In later examples we will use more complicatad expressions.

```
2780 REM CIRCLE
2790 REM
2800   T$ = "CIRCLE - THE
       EASY WAY"
2810   GOSUB 5000: REM pause
       & title
2820 REM
2830 REM Here is the easy way
2840 REM to make a circle.
2850 REM
2860   CIRCLE (160,100), 60
2870 REM
2880 REM
```

When this program runs, it praduces a circle in the centar of the scraen. The circle is somewhat flattened. This flattening varies from screen to screen. We will see how to fix this soon.

Wa should note that in all forms of the Circle command, tha current position is always updatad to ba tha center of the circla, not the last point drawn on tha figure.

Now let's explore the world of arcs. Many graphics systems don't have a circla statamant, lat alone an arc statemant. In those systems you would have to do things the hard way. That's what we will do in the naxt example. Once you see this, you will appreciata the power of tha Circle command.

The program that follows uses trigonomatric functions—in a way similar to what was done in connection with drawing polygons. Instead of actually drawing arcs, it draws spanning sections of 30-sided polygons. With the medium screen resolution we usa, you cannot tell the difference between this and a true circular arc. In our program we have again included a timer so that you can compara this method with a much easier and fastar mathod that will follow.

This program draws ten arcs, which all start at the center of the screen, but belong to different circles. Wa won't axplain the devious decisions wa mada to gat this program working in as faw staps as possibla.


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You are welcome to study the listing yourself. Notice that this program has a very important ingredient: Fudge. Because of rounding off errors, FOR loops with real indices do not always execute the very last case; hence, a fudge factor, which is called, naturally enough, FUDGE.

The program uses trigonometric functions and the Line command to draw the figure, and the computer's clock to time the program.

```
2890 REM MAKING ARCS - THE HARD
     WAY
2900 REM
2910   T$ = "ARCS - THE HARD
       WAY"
2920   GOSUB 5000 :REM pause
       & title
2930 REM
2940 REM This uses trigo-
     nometric
2950 REM functions.
2960 REM
2970   PI = 3.1415926535#
2980   A0 = 2*PI/30
2990   R  = 40
3000   FUDGE=.01
3010 REM
3020   TIME$="00:00:00"
3030   FOR       E0=0       TO
       2*PI+FUDGE
       STEP PI/5
3040 REM
3050     PRESET (160,80)
3060 REM
3070     FOR A = E0 TO -FUDGE
         STEP -A0
3080       X=R*COS
           (A)-R*COS(E0)
3090       Y=R*SIN
           (A)-R*SIN(E0)
3100        LINE -
           (160+X,80+Y)
3110      NEXT A
3120 REM
3130   NEXT E0
3140 REM
3150   LOCATE 3,1
3160   PRINT  "time  elapsed:
";
       TIME$
3170 REM
3180 REM
```

Now we will see how to make arcs using the CIRCLE command. An arc has a starting angle as well as an ending angle (in radians).

To make an arc, just tack the starting angle and ending angle onto the end of the CIRCLE command, and voilà: an arc. The syntax is as follows:

```
CIRCLE (xcenter,ycenter),
radius,color,start,end
```

where start is the starting angle and end is the ending angle (in radians).

In the example program below, we draw the same number of arcs as in the previous program. The positions are different in this program, but the programs are comparable because the arcs are of the same lengths as in the previous program. We have also put a timer on this program so that you can compare the speed of execution with the last program. You can see from the time output of the program that it runs significantly faster—about 15 times


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faster. It is elso much eesier to understand. For exemple, there is only one FOR loop, and the Circle command takes care of what was the old inner FOR loop.

Looking more closely et the program, we see that tha arcs are produced by the Circle statement on line 3330. The center (X,Y) of this circle is recomputed each time through the remaining FOR loop. The trigonometric functions in the FOR loop cause this cantar to rotate ebout the center of the screen, thus spicing up the picture. The radius *R* for eech arc is always tha same, and the color is also alweys the same, nemely 3. Each erc alweys starts at an engle of 0 redians, but each arc is longer then the previous one.

Actually, we could have eliminated the color parameter, but we must still have the commes that mark its plece in the command.

```
3190 REM ARCS - USING CIRCLE
3200 REM
3210   T$ = "ARCS - USING
       CIRCLE"
3220   GOSUB 5000 :REM pause
       & title
3230 REM
3240 REM this uses the circle
     statement.
3250 REM
3260   PI = 3.1415926535#
3270   R = 40
3280 REM
3290   TIME$="00:00:00"
3300   FOR E0 = 0 TO 2*PI+.01
       STEP PI/5
3310     Y = 100 - R*SIN(E0)
3320     X = 160 + R*COS(E0)
3330     CIRCLE (X,Y), R, 3,
         0, E0
3340   NEXT E0
3350 REM
3360   LOCATE 3,1
3370   PRINT "time elapsed:
       "; TIME$
3380 REM
3390 REM
```

In the abova example ell engles are nonnegetive. The Circle commend does something special if the engle is negetive; namely, it drews e radius. We will explore this later when we present a sample applications progrem which drews pie cherts.

The lest exemple in our "stand-alone" series shows how to squash or round out circles. The last parameter in the Circle command is called the *aspect ratio*. It is the ratio of the radius in the x-direction to the radius in the y-direction. When we change this quentity on the Circla command circle, we get an ellipse.

***MANY graphics systems don't have a circle statement, let alone an arc statement.***


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If the aspect ratio is lass than one, then the radius in the x-direction is equal to radius (as specified in the command) and the radius in tha y-direction is equal to radius*ospect. If, on tha other hand, the aspect ratio is greater than one, the radius in the x-direction is equal to radius/ospect and tha radius in the y-direction is equal to radius. The sample program for ellipses (following) illustrates these rules. This schame guarantees that radius (the specified radius) is always the maximum radius of the figure.

The sample program also illustrates the rules for aspect ratio. It has a FOR loop that steps through values for Aspect from 0 to 9 by avery tenth. If Aspect is lass than 1, then the color is equal to 1 (cyan), and if Aspect is greater than or equal to 1, the color is equal to 2 (magenta). Thus, you can separate the cases as the figure is drawn. As the picture unfolds you will first see bluish (cyan) ellipses, which are all the same horizontal (x-direction) radius, but are flattened vertically (y-direction). These have an aspect ratio that is less than one. Next you will see purplish (magenta) ellipsas, which are all the same vertical radius (y-direction), but are squooshed horizontally (x-direction). These have the aspect ratio greater than or equal to one. All ellipses fit within tha same circular region. Notice that the arc-making parameters in the Circle statement (line 3520) are absent, but their places are held by commas.

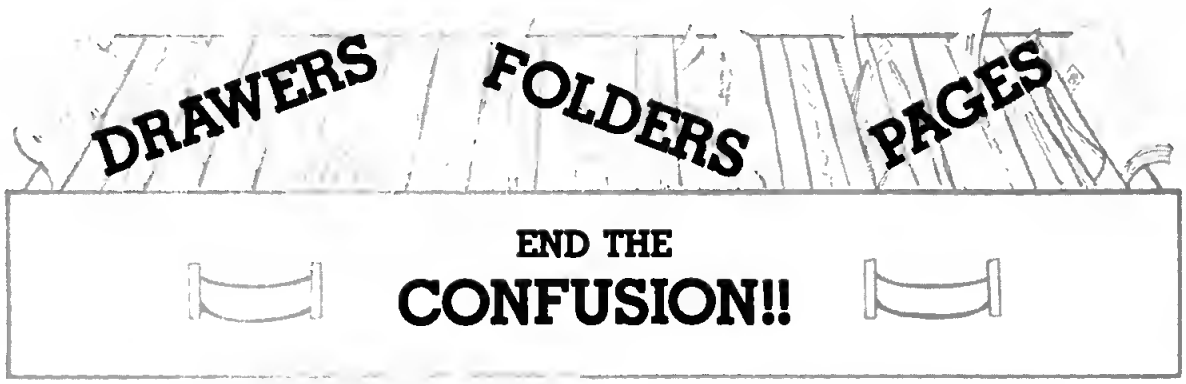
At the end of the program, we put a Locate statement (line 3550). This is to place the cursor out of the way when the program stops.

This program produces ellipses. If the aspect ratio is less than 1, the ellipse is drawn in cyan. If the aspect ratio is greater than 1, the allipse is drawn in magenta.

```
3400 REM ELLIPSES
3410 REM
3420   T$ = "FAMILY OF EL-
       LIPSES"
3430   COLOR 0,1
3440   GOSUB 5000 :REM pause
       & titla
```

## *A CIRCLE will never appear perfectly round for all displays.*

```
3450 REM
3460 REM This shows what you
     can
3470 REM do with tha aspact
     ratio
3480 REM
3490   PI = 3.1415926535#
3500   FOR ASPECT = 0 TO 9
       STEP .1
3510     IF  ASPECT<1  THEN
         C=1 ELSE C=2
3520     CIRCLE
         (160,100),60,
         C,,,ASPECT
3530   NEXT ASPECT
3540 REM
3550   LOCATE 23,1
```


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## Further Reading


David Rodgers and J. Alan Adams, *Mathematical Elements For Computer Graphics*, McGraw-Hill, 1976.

William Newman and Robert Sproull, *Principles Of Interactive Computer Graphics*, second edition, McGraw-Hill, 1979.

J. D. Foley and A. Van Dam, *Fundamentals Of Interactive Computer Graphics*, Addison Wesley, 1982.

David Fox and Mitchell Waite, *Computer Animation Primer*, Byte Books, 1982.


```
3560   END
3570 REM
```

In the IBM PC there is a "default value" given to the aspect ratio when nothing is specified in the Circle statement. This default value depends upon whether you are in the medium or high resolution mode. The default for medium resolution is 5/6 and for high resolution is 5/12. This is consistent with the fact that the difference in resolution between these two modes is merely a doubling of resolution in the x-direction. These aspect ratios were designed to give a perfect circle in both cases, but in practice this does not always happen.

In theory, a TV screen has an aspect ratio such that the vertical side is three-quarters the size of the horizontal side. Think of the screen as the lower three-quarters of a big square. With the 320×200 medium resolution mode, this fictitious square is approximately 320×267, which gives an aspect ratio of about 5/6. This is why IBM chose the 5/6 default value in the medium graphics mode.

Different TV sets and monitors will have slightly different aspect ratios. In fact, you can often make adjustments that will change the aspect ratio on a given TV monitor. Thus, no matter what you do, a circle will never appear perfectly round for all displays. The aspect ratio can be adjusted for each site. */PC*

---

In the next excerpt of IBM PC Graphics Primer, you con leorn how to moke your very own PC-Man, o gome thot bears o possing resemblonce to on orcode fovorite. You'll understond some of the secrets of controlling the motion of o choracter vio the power of string monipulotion.

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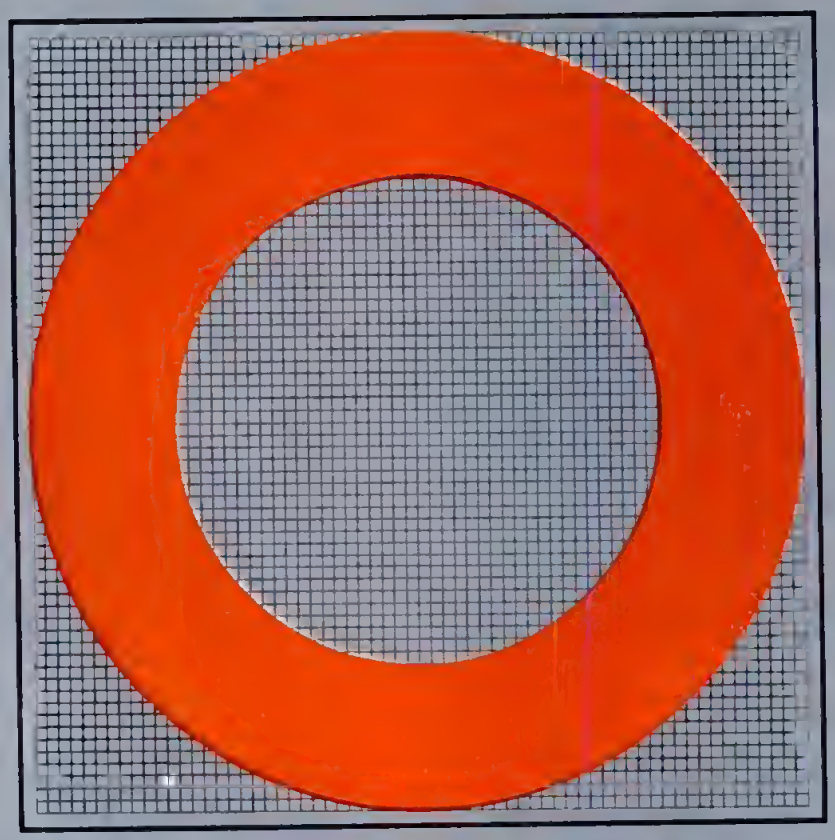
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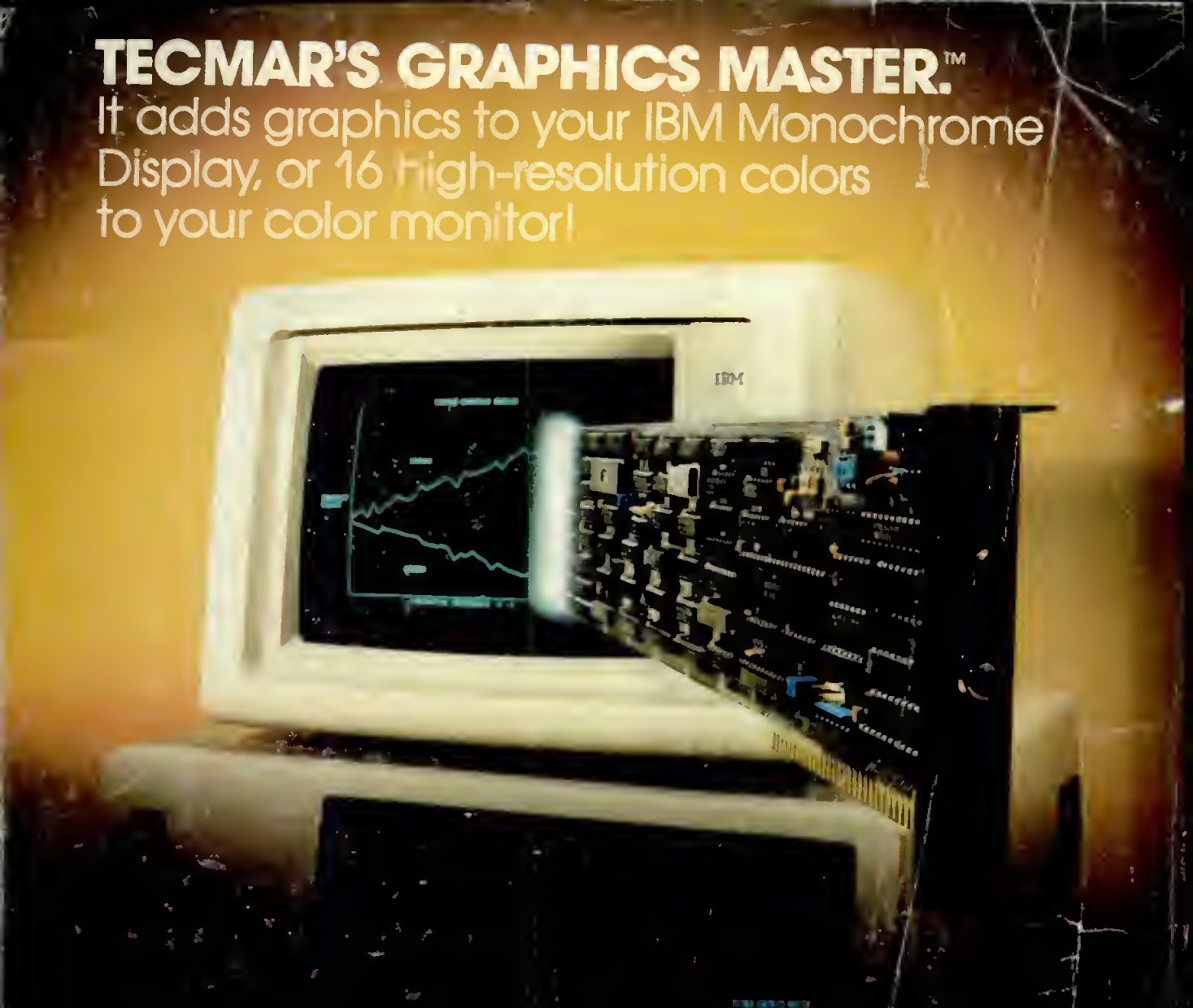
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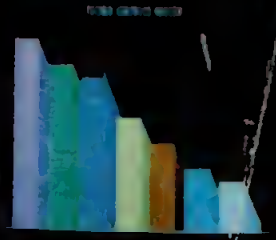
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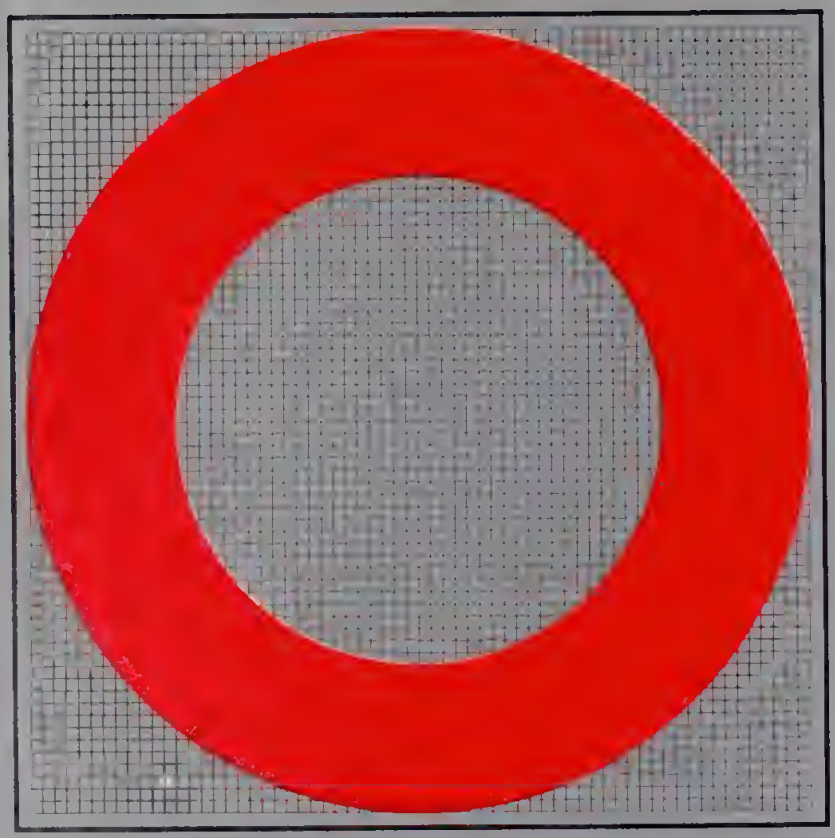
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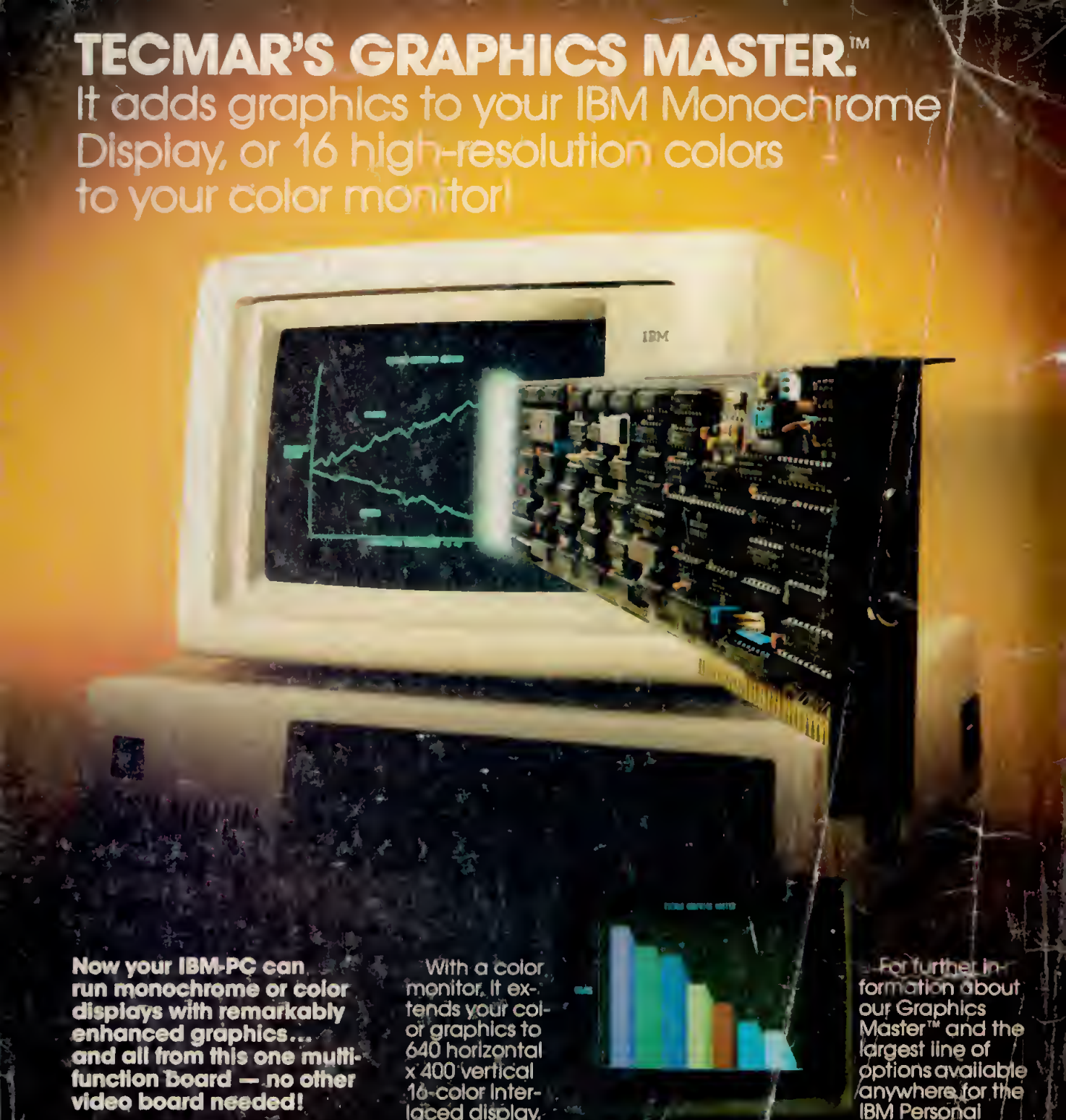
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This remarkable new board fully supports all IBM advanced BASIC color graphics functions.

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